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SEVERE INFECTIONS OF THE JAW BONES, WITH A REPORT OF TWO UNIQUE CASES

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I WISH to report two unique examples of a type of slowly progressive osteomyelitis of the upper jaw which extended to the skull, causing death eventually because of a meningitis, and to discuss generally "frank" osteomyelitis, a disease which holds an acute interest for the surgeon, the general dentist and especially the exodontist. At the present time, when those cases following fractures are excluded, I have had a series of fifty-nine patients to study and to treat. Because of the influence of the teeth and the tooth buds after the course of the infection, osteomyelitis of the bones of the jaws has a unique interest, in contrast to osteomyelitis of other bones.

Previous to a discussion of severe pyogenic osteomyelitic infection of the jaw bones, it may be of especial interest to describe briefly the clinical course of two cases with a progressive osteomyelitic and soft tissue destructive process of the upper jaw region, frontal region and base of the skull of a type that I have been unable to find in the literature.

These two patients were seen in consultation. The first (Fig. 2) was a patient of Paul F. Stookey and the second (Fig. 1) a patient of Charles C. Dennie. It is with their consent that I publish these reports. The comments are mine. Dr. Stookey finally concluded that his case might be a leishmaniasis and Dr. Dennie concluded that his case might be one of malignant syphilis. I have placed a somewhat different interpretation on them.

The clinical course of these two cases was strikingly similar. The patients were both men in middle life. Previously, they had been in good health. In each case, the onset seemed to have been associated with antral infection and trauma. (Figs. 1 and 2.) Accompanying and following the involvement of the maxillary bone, a small ulceration developed in the soft tissues anterior to the maxilla. Sloughing of the soft tissues and necrosis of the bone continued slowly. Both small and large sequestra formed. First, the front

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of the face and the nose sloughed away. Finally, the invasion extended to the frontal bone and the base of the skull. In both patients, the course of the disease extended over eighteen months before death from meningitis.

One of the patients (Fig. 1) had a history of receiving some "shots" several years previously. The Wassermann test of each was negative. Each received intensive antisyphilitic treatment. Each had a history of antral insult—one a kick by a horse (Fig. 2) and one an antral operation. Cultures, both aerobic and anaerobic, were made in both cases.

A B

Fig. 1.—Case of progressive osteomyelitis of maxilla which started after traumatic injury to antrum successively involving frontal bones and base of skull. Death finally resulted from meningitis. A, photograph taken January 13, 1939. B, photograph taken August 18, 1939, just before his death. (Case of Dennie.)

Biopsy specimens were taken in both and, finally, necropsy was performed. Each had tests for glanders and leishmaniasis (N.N.N. medium and tartar emetic). Biopsy consistently revealed granulation tissue. It is known that, in gangrenous conditions about the face and mouth, spirochetes are usually present. In one of these cases, some spirochetes were seen, but the pathologist (H. R. Wahl) was unable to identify them as *Spirochaeta pallida*. They were probably secondary invaders. Guinea-pig inoculations were made without positive findings. One patient (Fig. 2) had been in Mexico. The other patient (Fig. 1) had never been out of this country. In the latter case, rabbits were inoculated with the serum of some of the involved tissue but without conclusive findings.

Sometimes, a pyogenic osteomyelitis develops in the frontal bone, following a frontal sinusitis which progressively involves the bones of the dome of the skull. Blair has reported a few such cases. It has occurred to me that these cases may be of a similar nature. Both the maxillae and the bones of the dome of the skull are membranous bones. They have little or no ability to lay down new bone, and there is possibly less tendency to limitation of a low-grade inflammatory process than would be the case in non-membranous bone.

"FRANK" OSTEOMYELITIS OF THE JAW BONES

Rather arbitrarily, the term frank osteomyelitis of the jaw bones has been

chosen to designate the severer types of osteomyelitis. As a matter of fact, in both the acute and the chronic alveolar abscess, an osteomyelitis is present, but it is not common practice to use the term osteomyelitis in describing these lesions.

Incidence, Age and Etiology.—Several of the other bones of the body are considerably more frequently affected than the jaw bones by a severe osteomyelitis. The femur, tibia, humerus, radius, ulna, vertebrae and os calcis all take precedence in frequency of infection over the jaw bones, in the order named. Thus, the jaw bones might be considered as eighth in liability to severe infection (Liebold).

A B

Fig. 2.—Second case of progressive osteomyelitis of maxilla. The first indication of the onset of the condition followed an injury to the antrum. The osteomyelitis successively involved the frontal bones and the base of the skull, resulting in death from meningitis. A, photograph taken September 22, 1931. B, photograph taken December 7, 1932, at the time of death. (Case of Stookey.)

In 450 osteomyelitis patients at Mt. Sinai, Wilensky found the jaw bones involved in thirty-nine instances. The mandible is affected more often than the maxillae. In my series, the ratio was 38 to 16, and, in three patients, both the mandible and the maxillae were involved.

The disease is rather frequently seen in childhood and adolescence. Twenty-two of my fifty-nine patients were under 15 years of age. The male seems to be affected slightly oftener than the female (38 to 21).

The etiology holds considerable interest because of the frequency of association with peridental infection and trauma. In my series, eleven of the infections followed extraction during the acute phase of a pulpitis or peridental infection, and twelve developed from an infection of the pulp cavity unassociated with extraction; in five, trauma to the jaw region seemed to initiate the infection; in one, a corrosive fluid was accidentally injected (Fig. 3 A); in two, too much mercury was given (calomel, one, antisyphilitic treatment, one) and in twenty-nine, the origin of the infection was other than peridental or traumatic. Of this latter group, four were of the blood-stream type and nineteen were due to syphilis and six to excessive irradiation, one was due to noma and one to trauma of the cheek and three were due to leukemia. Three possibly originated from an infection of the maxillary sinus.

After comparison of the etiology of

these cases with that of other published series, the impression is gained that, at present, dentists do not so often extract a tooth during the acute stage as formerly. In my series, the number of patients with syphilitic infection of the jaw bone is rather high. This was due to the fact that these patients often were referred to me because it was considered that some reconstructive procedure would eventually be necessary. In these days, it is not uncommon to see an extensive osteomyelitis due to excessive irradiation.

Organism.—The organism which commonly causes osteomyelitis of the jaw is *Streptococcus hemolyticus.* Less commonly, the staphylococcus or a mixed infection causes the disease (Gilmer, Rosenow, and Moody and Haden). *Staphylococcus aureus* is usually the offending organism when the infection is blood borne. As a rule, a mixed group of organisms are associated with the infection when it is initiated by trauma or disease.

Pathology.—The progress of osteomyelitis of the lower jaw is influenced especially by (1) the presence of dental elements in the bone and (2) a unique blood supply. The process in the upper jaw may be influenced particularly by (1) the presence of the dental elements, (2) a unique blood supply, (3) the fact that the bone is of membranous origin and (4) the presence of the maxillary sinus.

Besides the preceding special conditions, osteomyelitis of the jaws shows the same pathologic changes as any other fibroblastic tissue having lime salts in the ground substance. Briefly, as the products of inflammation accumulate under tension, the vessels within the bony spaces become thrombosed. The bony trabeculae tend to be resorbed and the products of inflammation, following the path of least resistance, seek an outlet through the bony cortex. After the cortex has been perforated, some elevation of the periosteum occurs before it, in turn, is perforated. The cellular reaction encountered as a sequestration takes place and an involucrum is formed in the jaw bones is, on the whole, the same as that which occurs in other bones. It needs little comment here, save to emphasize that a line of demarcation is formed between the live and dead bone which is usually complete in from two to three months and, as long as any dead bone is present, the opening in the periosteum will persist, through which pus and débris will drain. It is to be remem-

A B

Fig. 3.—A, case of osteomyelitis of upper jaw in which corrosive solution was injected into soft tissues under impression that it was local anesthetic. B, typical sinus tract from foreign body, either dead tooth or dead piece of bone within jaw.

bered that the maxilla is a membranous bone, and therefore it lays down little or no new bone. The products of inflammation about a tooth cause the fibrillar connections between the peridental membrane and the cementum of the tooth to be disrupted. The cementum once denuded remains denuded. The cementum has no blood supply and does not exfoliate. As long as the tooth is present, the uncovered cementum acts as a non-viable, irritating foreign body. Before the teeth are erupted, the dental sacs may be involved in the inflammatory process. When this occurs, the unerupted tooth or teeth become isolated and nonviable and act as foreign bodies similar to a sequestrum.

The amount of devascularization of the bone depends on the degree of stripping of the periosteum on the one hand and the degree of central thrombosis on the other. Thus, if sufficient periosteum is stripped from either bone of the jaw while, coincidentally, the central blood supply is blocked, complete necrosis of the whole bone may ensue. This is especially true of the mandible, where the centrally located inferior dental artery furnishes blood to the central part of the bone.

The blood supply of the upper jaw is also somewhat unique. Wilensky recently has emphasized that the upper jaw receives its blood supply principally from two arterial branches, the anterior dental, which passes in front of the antrum, and the posterior dental, which passes behind it, to anastomose with each other in the superior alveolar process. As the blood supply from the periosteum to the maxilla is quite meager, the extent of the sequestration is particularly influenced by the location of the thrombus and the amount of thrombosis that may be present. In the type of osteomyelitis that may occasionally occur in nurslings, this may be particularly true.

A B

Fig. 4.—A, result of ankylosis of temporomandibular joint after plastic operation on joint. This case originated with an osteomyelitis of the jaw. B, sequestration of condyle and neck following purulent arthritis of temporomandibular joint.

Clinical Course.—The outstanding early local symptoms of osteomyelitis of the jaw, as in osteomyelitis elsewhere in the body, are severe, aching, throbbing, deep-seated pain, especially in the recumbent position, a developing local tenderness, worse on percussion, and local swelling, which eventually fluctuates if the tension within is not to great. The general symptoms are those which accompany

any pyogenic infection. As a rule, as soon as the periosteum is perforated, the pain decreases, but if the pus is evacuated in the soft tissues about the bone, the swelling tends to increase rapidly. The location of the main infection and the direction that the products of inflammation take as they enter the soft tissues influence the symptoms considerably. In involvements of the lower jaw, the pus sometimes extends into the deep tissues of the submaxillary region, the upper deep cervical region, or the tissues in the region of the anterior pillars. Involvement of the muscles of mastication will cause trismus, and swallowing will be impeded when the tissues of the floor of the mouth or pharynx are invaded. In osteomyelitis of the upper jaw, the inflammatory products may extend into the tissues of the anterior cheek, nose or palate. When the tissues of the hard palate are undermined, there may be no particular redness because of the compact structure of the soft tissues in this region.

When drainage is provided either spontaneously or by incision, the pain, swelling and constitutional reaction largely subside, but sinuses with pouting projections of granulation tissue persist as long as dead bone or dead tooth structure remains *in situ*. (Fig. 3 B.) A few cases of osteomyelitis of the jaw bone result in slow bone resorption without actual gross death of bone, but, as a rule, a definite sequestrum is formed, which takes about two or three months to become separated from the live bone.

Often, age influences the course of osteomyelitis of the jaw considerably. In nurslings, the characteristic invading organism is one of great virulency and, as a rule, septicemia precedes, accompanies or follows the infection. In children, often damage to the tooth buds necessitating their removal may seriously interfere with the subsequent growth of the jaw bone even if the extent of sequestration does not cause serious deformities.

In the bone necrosis accompanying a primary blood disease, the soft tissues about the necrotic bone usually show only a slight reaction. The constitutional symptoms tend to be more severe than the local condition would lead one to suspect. The general appearance of the patient, who is rather pale and yellow, and the fact that no other obvious etiology seems to be present suggest to one immediately that a blood smear is advisable.

The outstanding feature of an irradiation necrosis is the chronicity of the course, the continued pain, the slowness of sequestration, a lack of any tendency for either the bone or the surrounding soft tissue to show any of the ordinary tendencies of normal tissue toward healing, and finally lack of resistance to secondary infection.

When a child presents evidence of a bone infection in the region of the epiphyseal cartilage of the condyle, rather often it is difficult to be certain whether or not one is dealing with a purulent arthritis of the temporomandibular joint or a true blood-borne osteomyelitis of the type more commonly seen in the other long bones. (Fig. 4 A and B.) The region in front of the ear is swollen and tender and, in either case, great difficulty is experienced in moving the lower jaw. The joint cannot be aspirated well. The only possible distinguishing signs are that the swelling and point of maximum tenderness should be lower in an osteomyelitis and less difficulty should be experienced in moving the lower jaw.

Sequestrum.—The sequestrum varies greatly in size. It may be in almost any location. The sequestrum tends to be smaller in the upper than in the lower jaw. Characteristically, in the necrosis due to ingestion of mercury, the alveolar ridges were lost, principally. In irradiation necrosis, characteristically the whole thickness of the mandible becomes secondarily infected and necrotic. In the syphilitic cases, the palatal process or the

frontal process of the maxillae was involved by extension from the nasal bone.

The Roentgenogram.—Early, some mottling of the bone usually is to be seen in the roentgenogram. Usually, after six or seven weeks, one may get some idea of the probable extent of the sequestration. A hazy, moth-eaten, uneven outline between the edges of the live bone and the dead bone begins to become evident and the sequestrum shows as an irregularly shaped piece of bone lying in a cavity surrounded by either uninvolved bone or new bone. Later, the sequestrum loses some of its density. In those cases in which the necrosis extends through the full thickness of the jaw, the roentgenogram aids in judging the extent to which the involucrum or new bone has formed. Repeated roentgenographic examination over a period of from six to nine months may be necessary before there seems to be sufficient new bone to ensure that the contour of the lower face will not be altered when the sequestrum is removed.

Prophylaxis.—A question of great importance is whether one should extract a tooth during the acute stage of peridental infection. Exodontists of wide experience state that, in most instances, early extraction of the tooth at fault will give drainage and may prevent the onset of a true osteomyelitic process. They believe that those few cases that eventually show signs of an osteomyelitic process would have done so anyway. On the other hand, surgeons who see the "frank" cases of osteomyelitis have been inclined to point out the dangers of extracting a tooth during the acute stage.

Probably, in addition to the factors of virulency of the infection and the resistance of the patient, the crux of the situation is the amount of trauma inflicted in the removal of the tooth. If the tooth can be simply and easily lifted out of its socket, it is probable that the operation is similar to the one of early trephining in an osteomyelitis of a long bone. If the infection does not have clinical signs of great virulency, early extraction with little trauma will give relief from pain and usually is generally beneficial. On the other hand, infliction of considerable trauma in the removal of the tooth would result somewhat similarly to a radical procedure early in the course of an osteomyelitis of a long bone, a procedure long known to be distinctly contraindicated.

It probably also should be remembered that the analogy in comparison with osteomyelitis of the long bones in general breaks down somewhat as far as the organism that most often causes osteomyelitis of the jaws is concerned. An acute peridental infection is usually caused by *Streptococcus hemolyticus,* while the organism encountered elsewhere is as a rule *Staphylococcus aureus.* This warns one to lean to the conservative side when in doubt.

O'Kell and Elliott made blood cultures on a series of patients after extraction of teeth in septic mouths and they found that "within a few moments after the extraction of teeth from obviously septic mouths, a streptococcal bacteremia lasting a few minutes may be observed in 75 per cent of cases." The observation is of great importance to the subject in hand, and certainly gives one food for thought.

From a perusal of the cases that I have seen, I would judge that one might use the same type of surgical judgment in regard to this matter that should be used in regard to an acute, subacute or chronic osteomyelitis in bones other than the jaws. If the infection does not give the clinical signs of great virulency, if the general health of the patient is good and little trauma is necessary to extract the tooth, extraction may be beneficial. However, if the clinical signs of the infection suggest considerable virulency, the patient is debilitated and it appears that the extraction would be associated

with considerable trauma, early extraction should not be performed.

Treatment.—After development of a true osteomyelitis, the patients whose cases are reported herein have been treated conservatively while the process was acute. As soon as definite evidence of localization of the products of inflammation occurred, the soft tissues were incised, but operation on the bone was considered to be contraindicated. Whenever internal incision seemed unlikely to give adequate drainage, drainage by external submandibular incision was made.

During the period between drainage of pus and sequestration, the treatment was symptomatic and supportive. When the time interval was sufficient for the sequestrum to have separated, an approach was made through an incision in an inconspicuous position which allowed fairly direct approach. The sinus tract was followed and all dead bone was removed.

If a sinus tract led to a tooth root or to a tooth bud, this was removed. All overhanging edges of the bone were removed. Thus, one side of the bone was saucered out so that the soft tissue could fall into the defect. For the first week, the wound was gently packed open with a strip of iodoform gauze, which, as a rule, was changed every other day.

The exception to the foregoing procedure as to the time of the sequestrectomy occurred in two patients with gross sequestration of the whole thickness of the lower jaw. In one, it was deemed wise to wait six months and, in a second, nine months, to allow sufficient new bone to form to maintain the contour of the lower part of the face. In the majority of cases, only one operation was found to be necessary to effect a cure if the operation in the chronic stage was thorough and complete.

The conclusion to be drawn from a study of the pyogenic group as a whole is that, as a rule, treatment during the acute stage should be conservative, but, on the contrary, after sequestration has been effected, fairly thorough and somewhat radical treatment is most effective.

Prognosis.—Of the patients with pure pyogenic osteomyelitis, thirty-four were cured after one operation. Three had more than one sequestrectomy. None died. In two cases of irradiation necrosis, one-half the mandible was resected before separation was complete, for the purpose of relieving pain. In most instances, the sequestrum in the syphilitic cases finally separated and was exfoliated spontaneously or was removed by forceps without anesthesia. The patient with noma, the three patients with leukemia and two patients with irradiation necrosis died without operation. Their condition was such that operation was deemed a hopeless gesture.

SUMMARY

Two patients suffered from a unique chronic progressive osteomyelitis of the maxillae, base of the skull and frontal bones which terminated in a fatal meningitis after a period of about eighteen months. It is suggestive that the process seemed to start in the maxillary sinus and progressively involved membranous bone.

Although "frank" osteomyelitis of the jaw bones is not common, the disease is of considerable seriousness and often does not receive the care promising the best results. In children, owing to interference with the non-erupted teeth, the resulting deformity of growth is apt to be considerable. In both children and adults, gross loss of a part of the mandible, especially, may result in a deformity and considerable disability.

Treatment during the acute stage of a "frank" pyogenic osteomyelitis should be conservative. After sequestration, fairly thorough and somewhat radical treatment is most effective.

BIBLIOGRAPHY

BLAIR, V. P.: Editorial. *Surg., Gynec. & Obst.*, 37:845, December 1923.

BLAIR, V. P.; BROWN, J. B., and MOORE, SHERWOOD: Osteomyelitis of Jaw. *Missouri M. J.*, 27:173, April 1930.

BLAIR, V. P.; PADGETT, E. C., and BROWN, J. B.: Diseases of Face, Mouth and Jaws; in GRAHAM, E. A.: Surgical Diagnosis. Philadelphia: W. B. Saunders Co., 1930.

BONNER, H.: Osteomyelitis of Jaws in Infants. *Beitr. z. Klin. Chir.*, 133:163-183, 1925.

HADEN, R. L.: Dental Infections and Systemic Disease. Philadelphia: Lea and Febiger, 1928.

LEIBOLD, H. H.: *Journal-Lancet*, 45:113, March 1, 1925.

O'KELL, C. C., and ELLIOTT, S. D.: Bacteremia and Oral Sepsis. *Lancet*, 2:869-872, 1935.

PADGETT, E. C.: Surgical Diseases of Mouth and Jaws. Philadelphia: W. B. Saunders Co., 1938.

WILENSKY, A. O.: Osteomyelitis of Jaw. *Arch. Surg.*, 25:183, July 1932. Osteomyelitis of Jaws in Nurslings and Infants. *Ann. Surg.*, 95:33, January 1932. Association of Osteomyelitis of Skull and Nasal Accessory Sinus Diseases. *Arch. Otolaryng.*, 15:805, June 1932.

ZARFL, M.: *Ztschr. f. Kinderh.*, 25:266, June 1920.

ROSENOW, E. C.; GILMER, T. L., and MOODY: Quoted by BLAIR, V. P.; PADGETT, E. C., and BROWN, J. B.: Diseases of Face, Mouth, and Jaws, in GRAHAM, E. A.: Surgical Diagnosis. Philadelphia: W. B. Saunders Co., 1930.

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USE OF GOLD FOIL IN GENERAL PRACTICE

By W. L. FERRIER, D.M.D., Seattle, Wash.

THERE have been, in the past, many discussions as to the relative merits of gold foil and gold inlay operations. Differences of opinion have formed the basis for debate before dental associations by enthusiastic advocates of each method of restoring lost tooth structure. The participants in these debates were usually those who advocated and used gold inlays, without knowledge or training in gold-foil technic, on the one side, and those who were trained in the technic of gold-foil operating and also gold-inlay technic on the opposing side. These discussions were one-sided affairs, as it is obvious that one skilled in the use of gold foil as well as gold inlays was better qualified to judge their relative merits. Many operators use no foil whatsoever, while most operators who use foil use inlays wherever indicated; for each has separate and distinct indications, and there need be no conflict in choice between gold foil and gold inlays, generally speaking, and there is none in the practices of those who are sufficiently versatile to make creditable operations by either method.

I am convinced from long experience with all methods and materials that gold foil fulfils more nearly the requirements for an ideal filling material than any substance known. While this opinion may be taken as entirely personal, it is substantiated by the writings of foremost educators and practitioners of the past and those of the present who are proficient in the use of all the filling materials common to present-day practice. To disregard the qualities of any of our filling materials that may make them most suitable for a given case is a short-sighted policy indeed. All filling materials have properties that recommend them for certain operations and, in the absence of an ideal filling material, we should employ them for these operations without

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prejudice and should develop the operative technical features that are peculiar to some and common to all of them.

Operative dentistry has been sadly neglected by the profession at large during the past two decades. The tendency has been to center attention upon restoring lost teeth rather than lost tooth structure. It would seem that the highest attainment of dentistry was the construction of large fixed and removable pieces to restore lost teeth that could have been saved by intelligent and skilled operative procedure at the inception of dental decay or periodontal lesions.

The use of silicate cements has multiplied the indications for porcelain jacket crowns and fixed bridges in the anterior

Fig. 1.—Buccal and lingual walls of proximal portion converging toward occlusal surface.

part of the mouth, and faulty technic and carelessness in the insertion of gold inlays have had much to do with the loss of pulps in the posterior teeth, resulting in extractions and replacement with fixed and removable pieces in endless variety. In short, unwise or faulty operative procedures have forged all too often an unbroken chain of destruction, finally and prematurely resulting in the loss of the teeth through pulp complications, periodontoclasia and systemic disturbances. Dentures are constructed and the very thing that we had hoped to obviate has come to pass.

Dentistry has more to offer humanity than the seemingly inevitable conditions just recited. We have had at our command, to preserve the human teeth, for a period greater than our professional lifetime, materials and a technic for their employment, but in our almost universal desire to find an easy method to restore lost tooth structure, we have not made proper use of these older materials,

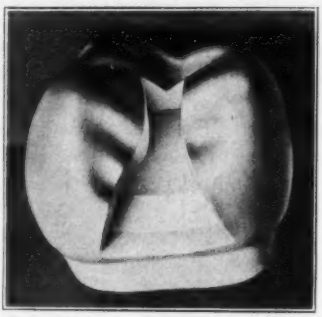

Fig. 2.—Narrow occlusal step. Sufficient dentin remains to protect the horns of the pulp.

Fig. 3.—Black parallel lines indicating amount of tooth structure saved when gold foil filling is placed instead of inlay.

and operative dentistry has suffered thereby.

Let me say, especially to those younger in the profession, that there is no easy method of restoring lost tooth structure to the condition of permanency that we have a right to expect. The most cele-

brated operators of the past and present work with a diligence second to none in any vocation of life, eternally seeking improvement in their technic, with concern about each and every operation. It is true that they do work with an ease that seems simplicity itself, gained by years of experience in close application to detail; but make no mistake: there has been no royal road to the attainment of their technic and there has been no effort spared in attaining it.

Gold inlays have suffered more from inefficiency than has gold foil. The inlay lends itself to a slovenly technic if the operator is so disposed. Some sort of a filling may be easily made from a wax pattern and, for a time, the cement will fill in the discrepancies, and the uninformed patient has no reason to suspect that other than an excellent operation has been performed. But if the ultimate is sought in an inlay operation, as much time and effort must be expended as for the insertion of gold foil. The results obtained with a carefully made inlay where indicated fully justify any necessary amount of time and effort.

Gold inlays have not had a fair chance with the majority of the profession. They are more often than not made without the use of the rubber dam, which is essential to cavity preparation, the forming of the wax pattern and the final seating and finish of the inlay. They are usually made of hard gold, which does not give the fine margins obtainable with alloys. If I have had any success with inlays, and I have used them since the inception of the casting process, it is largely due to the use of the rubber dam throughout the operation wherever possible, and the use of a casting gold not less than 23-K. fine for all inlays not subjected to great stress.

Gold foil and gold inlays, having such distinct and separate indications, should not conflict. I realize that what may be an indication for the experienced operator may not be an indication for one of less practice and skill. To draw a hard and fast line of distinction and to cover all closely overlapping indications is, of course, impossible. I prefer to use gold foil in all cavities of decay and erosion where the size and position of the cavity in the mouth and the age and temperament of the patient will permit. An actual count of all filling operations made in my practice for a ten-year period showed that 44.9 per cent were made with gold foil.

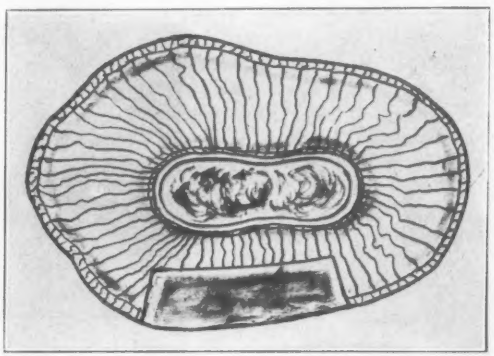

Fig. 4.—Cross-section of Class 2 cavity in bicuspid. The buccal and lingual walls are placed at an obtuse angle, not undercut to the axial wall. Figure 2 shows the retentive form.

I desire to present here a type of dental service that I practice in my own office, something suitable for most men; a type not reserved for the few who are

naturally talented, but applicable by all those who are willing to put forth the effort essential to do things worthily. It has no place in the hands of indifferent practitioners.

I shall consider the types of cavities that are particularly suitable for gold-foil operations, with such variations from type as most often occur.

CLASS 2 CAVITIES

Class 2 cavities (Fig. 1), especially in their incipiency, offer ideal situations for gold foil. The areas most susceptible to the recurrence of decay are the linguo-

Fig. 5.—Sagittal section of upper bicuspid and Class 2 cavity. The unbroken lines at the gingival third indicate non-cohesive gold. The broken lines of the remaining two-thirds indicate cohesive gold foil and the direction in which the layers are placed.

gingival and buccogingival angles of a Class 2 cavity and these angles may be extended well out into areas of immunity without a corresponding extension of the buccal and lingual walls as they approach the occlusal portion of the step. The bicuspids and molars, having a greater diameter buccolingually at the middle third than at the occlusal third, together with a rounding off at the lingual cusps to form the embrasure, opening occlusally as well as lingually, call for a linguogingival angle that is sharply acute. This principle may be applied in a limited degree to the buccogingival angle. (Fig. 2.) As the lingual and buccal walls approach the occlusal surface, they converge toward each other, forming a proximal cavity that is much narrower at the occlusal third than at the gingival third. This shape permits a narrow step across the occlusal surface that blends in fine proportion with the proximal portion of the cavity. A cavity so outlined meets all the requirements of extension for prevention, and, when the interior is formed, fulfils all the essentials to convenience, retention and resistance.

Fig. 6.—Mesial surface lower first bicuspid Class 2 cavity; showing angulation of buccal and lingual walls.

Much tooth structure is saved by such a preparation; the horns of the pulp have greater protection, and the strength of the tooth is but slightly impaired.

Thus, we suit our technic to the conditions met with instead of making the preparation suit our technic, as is necessary in preparing a cavity for the withdrawal of a wax pattern. Let us assume that the operator is skilled in both technics, that he can, in a given case, make a good gold-foil filling or a good inlay. Is it not apparent that, in the interests of tooth conservation alone, he should use gold foil as his filling medium rather than

a gold casting? Let us disregard for the moment the advantages of each as a material for restoring lost tooth structure and consider only the tooth and as an organ not capable of regenerative processes, as are bone, muscle and the mucous membrane. Let us acknowledge that once any part of it is lost, it can never be restored in kind, and that any restoration in any material falls far short of the original. Is it not then apparent that the logical thing to do is to restore the lost part with as little sacrifice of the remaining structure as possible? The cavity shown in Figure 1 is a good example of conservative preparation. The buccal wall will scarcely be visible from any point of view, yet the buccogingival angle will be immune to further decay.

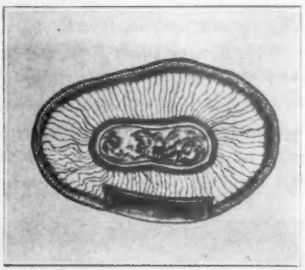

Fig. 7.—Cross-section through lower first bicuspid. Retention is obtained by undercutting the buccal and the lingual walls.

Fig. 8.—Occlusal view of cavity with narrow gingival wall mesiodistally.

The lingual wall converging toward the occlusal surface permits a narrow step, a strong lingual cusp and an immune linguogingival angle. Compare this with the outline form of an inlay preparation whose gingival wall has an equal buccolingual dimension, and note the tooth structure saved by the former. (Fig. 3.)

The cavity shown in Figure 1 is subject to many variations to suit the conditions present, particularly the mesial surface of the lower first bicuspid. This tooth resembles a cuspid whose cingulum has been overdeveloped. (Fig. 6.) Stress is exerted on the buccal cusp from the distal angle of the upper cuspid when the jaw is moved in a lateral excursion. A gold-foil filling placed in the mesial surface of this tooth is subjected to no stress, and the preparation may be exceedingly conservative. In fact, we may here violate a principle of cavity preparation that applies to all other Class 2 cav-

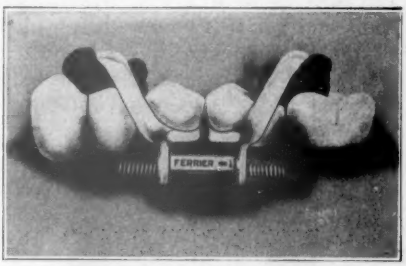

Fig. 9.—Ferrier separator adjusted to obtain necessary space; modeling compound used to stabilize instrument.

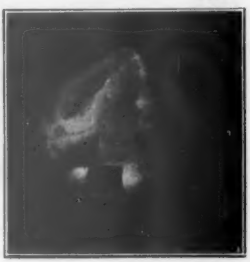

Fig. 10.—Occlusal view of Figure 8. Only a small amount of gold is visible.

ities; namely, that retention must be in the step or occlusal portion. Here, retention may be entirely in the proximal portion of the cavity, as it has no step for retention and none is required. (Fig. 7.) The buccal and lingual walls converge decidedly toward the occlusal surface, because the tip of the buccal cusp occupies a position at or near the center of the tooth and the cusp itself comprises four-fifths of the occlusal surface. To cross the triangular ridge of the buccal cusp to form a step weakens the tooth and is not essential to the retention of the filling. Therefore, we undercut the buccal and lingual dentinal walls,

Fig. 11.—Cavity preparation for distal surface of lower cuspid. The lingual wall is not extended on the lingual surface. Access to the cavity is obtained at the expense of the labial wall.

but not the enamel at the occlusal opening of the cavity. This procedure, together with the convergence of the buccal and lingual walls toward the occlusal surface, affords ample retention.

Figure 8 illustrates a small cavity, the gingival wall of which is very narrow mesiodistally and which requires a careful technic for insertion of foil.

A separator is usually placed at the beginning of cavity preparation, as we desire only enough buccal extension to permit a self-cleansing margin, and this minimum cannot be obtained without separation. By the time that the cavity is prepared, the spring of the separator has gained sufficient space in which to manipulate the foil with the assurance that a proper contact can be made with the distal surface of the cuspid. Three small cylinders of non-cohesive foil (usually about one-sixteenth of a sheet of gold each) are placed on the gingival wall in the manner that has been so often described in connection with typical Class 2 cavities, and malleted securely to place. If too much soft foil is used, the retention for the cohesive foil

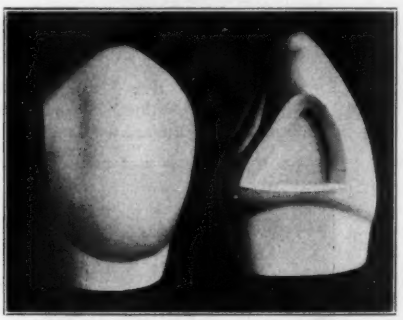

Fig. 12.—Cavity form and filling of distal surface of upper cuspids.

is reduced to an unsafe degree and care must be taken that the cylinders are not too large. Insertion of the cohesive foil is started with small pellets in the point angle formed by the buccal or lingual wall with the axial wall and the soft gold on the gingival wall, a holding instrument being employed for stabilization until the cohesive foil is anchored. Successive pieces of gold are placed and condensed until the cavity is full and the filling contoured. Gold foil is capable of great wedging force, and more care must be used here than ordinarily to prevent fracture or undue strain on the undercut buccal and lingual walls. The fill-

ing is finished in the usual manner, the soft foil facilitating the finish of the gingival margin. (Figs. 7, 8, 9.)

Cavities like the one shown in Figure 10 are of frequent occurrence in the bicuspids of young people. The technic that I describe is adaptable to nearly all of them. For meeting all the requirements of a filling operation, this is the most conservative method of all that are employed on the proximal surfaces of teeth. To those who make inlays for these cavities and who are most concerned regarding the appearance of the teeth, let me recommend this small, inconspicuous example of the foil operator's art.

Fig. 13.—Cavity prepared in proximal surface of lower incisor. Gold need not be visible.

Class 2 gold-foil fillings should not be placed where the size or position in the mouth puts an unreasonable strain on the patient or the operator. Where indicated, they may be made with less loss of tooth structure and are less conspicuous and more in harmony with the form of the tooth.

CLASS 3 OPERATIONS

As this presentation is intended to comprise only those operations that are most applicable to general practice, none will be included that might be considered impractical in many cases because of inharmony of color—the principal objection to gold foil in Class 3 cavities, in so many of which gold foil may be used without being conspicuous that a good working knowledge of the technic is desirable if the best interests of the patient are to be served. The preparations vary somewhat from the typical.

The distal surfaces of lower cuspids are frequently involved by the decay adjacent to them in the mesial surface of lower first bicuspids just described. When these areas occur in pairs, the operation is much simplified as the cuspid may be restored after the cavity in the bicuspid is partially prepared and, with the aid of separation, free access to the diseased

Fig. 14.—Typical Class 5 cavity. This form is subject to many variations to suit operative requirements.

area is attained. These cavities follow the typical Class 3 preparation and are made surprisingly small. Extension requirements may be met without any appreciable showing of gold and this showing only at an angle of vision never revealing it in ordinary conversation. Of all the sins committed in the name of operative dentistry, the practice of removing the middle third of the lingual wall of the distal surface of a lower cuspid with a round bur and jamming therein a mass of silicate cement that does not even extend to the labial surface,

where a semblance of a marginal finish may be made, is indeed the worst. Is there any wonder that there is a growing concern among many operators as to the failure of operative dentistry to live up to its responsibilities?

Cavities in the distal surfaces of lower cuspids may occur where the mesial surface of the first bicuspid is not involved or where there has formerly been placed a good filling that should not be removed. In this situation, it frequently is advisable to make a preparation that varies from type. The approach is gained at the expense of the labial wall, which is cut well out to give access to the linguogingival angle and the incisal angle. (Fig. 11.) The lingual wall is left standing wherever possible, as its removal increases the difficulties of placing the gold and weakens the incisal angle, which is subjected to much stress and wear. By mechanical separation, access is gained so that a lingual margin barely visible through the lingual embrasure is obtained. Such fillings are visible only when observed at right angles to the tooth and this line of vision is rarely taken.

All too often, we find decay upon the distal surface of lower cuspids where the distal angle of the tooth has been worn down to a point level with the marginal ridge of the first bicuspid. Gold foil cannot be well retained for any length of time, and, in such a situation, a Class 4 inlay is indicated. Foil will serve us well, and better than anything else, if we confine it to its indications, but we must not expect too much, and continual wear and stress on a thin angle will soon prove its undoing.

Class 3 cavities in the distal surfaces of upper cuspids have long been considered most difficult to restore and many types of preparation have been devised. If the cavity has not been treated with cement in the ridiculous manner just described for lower cuspids, a cavity form may be made that offers no unusual difficulties. The distal angle is removed sufficiently to allow an accessible and adequate incisal anchorage so that gold may be placed with the proper line of force. The cavity is boxlike in its entirety, with a slight incline of the strong gingival wall toward the axial wall to obtain all the retention possible. The linguogingival shoulder that I have described in former papers here frequently becomes a definite angle into which foil may be condensed with a direct line of force. The tooth has a strong root and will tolerate a well-condensed filling. In finishing the operation, the incisal angle is well sloped to prevent any direct stress in mastication. (Fig. 12.) There is but one choice of material in this situation and that is gold foil. I have used it in this cavity preparation for nearly twenty-five years and

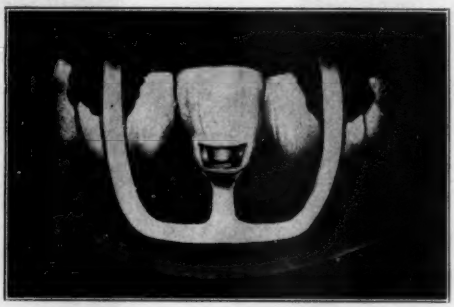

Fig. 15.—Ferrier cervical clamp, adjusted with modeling compound for support.

I have had just that many years of satisfaction in treating a troublesome area of decay, in a common sense manner, reduced to simplicity by virtue of the cavity form.

There is an area of decay that calls for a Class 3 preparation varying from type, one that occurs with less frequency than in any other proximal surface of the teeth—the cavity in the proximal surface of the lower incisor. (Fig. 13.) These areas are usually immune to decay, and cavity forms should be made with this in mind. The teeth are small and require areas of preparation in keeping with their size. The incisal angles must be safeguarded at the expense of all else, as, once the angle is lost, it is impossible to restore it esthetically. Fortunately, we may consider the point where it is safe to lay the incisal angle of the cavity within an immune area. The lingual wall is left standing to further strengthen the incisal angle and the linguocavosurface angle is also in areas of immunity. The cavity form here shown may be reduced in size to a point where it can scarcely be seen. I believe that much liberty can be taken with the outline form of cavity in these teeth because of the general immunity that they enjoy. They are easily separated and readily accessible in placing foil in any part of the cavity. Cements of any kind have no place in the lower anterior teeth, with the possible exception of the case of very young people. Something enduring is essential. The teeth are so small that not many renewals can be made without loss of the angle or the pulp or both. If they could not be made inconspicuous when operated on at the beginning of decay, I would not include them here, as I am striving to show the wide use to which gold foil can be placed, eliminating entirely its principal objectional feature, lack of color harmony. In teeth that have decayed to the point where gold is objectionable to the patient because of its color, porcelain inlays are indicated. The septal tissue is full and much of the filling is covered interproximally, and a healthy gum tissue cannot be maintained under these conditions with cement fillings of any kind.

Fig. 16.—Non-cohesive gold used to line the peripheral walls. The flattened cylinder, placed diagonally, is forced gingivally to lock the mesial and distal cylinders. The incisal wall is covered in like manner. The remainder of the filling is made with cohesive gold.

Fig. 17.—Finished gingival third gold foil filling. The gum tissue covers the gingival and most of the mesial and distal margins, the outline of the filling then being in harmony with its surroundings.

CLASS 5 CAVITIES

The cavity form for Class 5 cavities shown in Figure 14, with slight modifications to suit individual tastes and with such variations as conditions warrant, seems to be meeting with widespread approval. I have had the satisfaction of seeing the technic that has been presented on a number of occasions adopted by men high in the profession. The success of the operation does not lie in the use of the specially designed clamp, as I designed the clamp only six years ago. It is a helpful instrument and the best that I have to date, but is not essential to a good Class 5 gold foil operation. Other clamps serve well, and some kind of clamp is indispensable. As the proper use of clamps became known, the practice of cutting away the gum tissue for such a simple procedure as the placing and finishing of gold foil in gingival cavities was abandoned. I have never found it necessary to cut away gum tissue in this type of cavity, not in one single instance. The technic, which is fairly well known, is fully portrayed in Figures 15 to 17.

My purpose is to show that there need be no conflict in the use of gold foil and gold inlays in these cavities of decay and erosion. Gold foil is always indicated unless the cavity is so large that the vitality of the tooth will be endangered from the trauma of excessive malleting. There are inaccessible places in the mouth where gold foil cannot be used and something else must be substituted. These cases, however, constitute but a small percentage of those that occur. Foil may be placed at one appointment and the clamp adjusted but once; and adjust it you must, or the gingival margin will never be finished as it should be, regardless of what filling material may be used. The gum tissue takes more kindly to a gold foil margin than any other, largely because it is capable of such a high finish. Long clinical observation on all types of filling materials substantiates this view, and, for the foregoing reasons alone, I cannot see how there can be any question as to the filling material most desirable.

In presenting this paper an attempt has been made to show that gold foil may have a wide use in the general practice of dentistry. All fillings may be made with less sacrifice of tooth structure than in preparations for inlays in similar positions and, in some cases inlays should not be placed at all. An attempt has been made to place gold foil and the gold inlay each in its proper place, uninfluenced by enthusiasm for one or prejudice against the other. We are fortunate in having both methods of tooth restoration.

A combination of circumstances and events has during the past decade done much to revive interest in the gold foil filling among large groups in various sections of the country. This is highly gratifying to one who has spent the major efforts of a professional lifetime in trying to perfect a technic that would be applicable to the practices of most men.

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CORRECTION OF SOME MISUNDERSTANDINGS REGARDING AN IMPRESSION TECHNIC FOR STATIONARY FULL LOWER DENTURES

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EVER since the promulgation of a universally applicable scientific technic for producing stationary lower dentures before this Association at the New Orleans Session in 1935 by Sidney C. Fournet and me, interest in the process has steadily mounted. Like many other new procedures, this one has been accompanied by a great many misconceptions. One of these is the natural difficulty inherent in the effort to transmit ideas by the written word, coupled with the difficulty experienced by some of converting the abstract into the concrete. On the other hand, we have the natural reaction of those with already fixed opinions on the subject and whose resistance to new ideas sometimes causes them to make statements that may lead the unwary astray. But the most common cause of misunderstanding is the lack of a fundamental knowledge of the physics, anatomy and physiology of the processes involved in primary retention of dentures. This is at least partly traceable to failure of our dental educational institutions to coordinate with our strictly dental subjects the basic elements of scientific learning. For all these reasons, it seems timely to try to clear up these misunderstandings by both words and pictures.

To those who still make the mistake of trying to complete an impression in one operation, it is necessary to stress the fact that no full denture impression, upper or lower, can be made in one operation and have maximum stability. It requires a series of operations during which the various physical factors are more or less singly developed and tested. This process was described in an article which appeared in the June 1939 issue of THE JOURNAL. It so happens that the upper impression lends itself better to separation, demonstration and test of each individual factor than the lower; that is, for the purposes of teaching and understanding these basic principles. But there is no fundamental difference in the application of these principles to the lower, even though the end-result is attained by changing the order in which these factors are developed. The stationary lower is held in functioning position by the application of identically the same primary retentive factors that have worked so successfully in retention of the upper, but with an even better result.

Now let us look into the mouth as we see it every day, while I point out some of the anatomic features to refresh our memories. (Fig. 1.) Directly behind the line of the teeth rises the pterygomandibular ligament. This is not the ramus, although many dentists seem to think that it is. The heel of a denture rising against this ligament only can have no horizontal stability because the ligament is composed only of soft movable tissue. By moving buccally one-half to three-quarters inch, we come to the retromolar fossa, which is at the base of the

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ramus itself. The buccal margin of the retromolar fossa is formed by the external oblique ridge. Both of these are normally covered by the buccal fold (not shown in this picture), which crosses from the cheek to the pterygomandibular ligament. Under this fold should lie, in comfort, the distobuccal flange of the lower denture, to secure horizontal stability. In the cheek opposite the first molar is located the buccal pouch. Please remember the distinction between the buccal fold and the buccal pouch: they are not identical and this fact will be referred to again.

Now let us look at the floor of the mouth. (Fig. 2.) Here, I wish to call

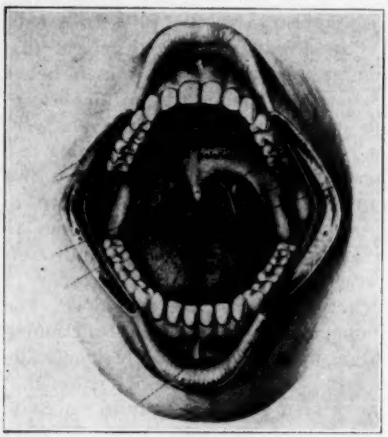

Fig. 1.—Interior of mouth, showing anatomic features.

attention to the fact that the mylohyoid muscle only supports the floor of the mouth, by direct contact, in the distal area. Anteriorly to the second bicuspid, the space between the mucous membrane and the mylohyoid muscle increases as the symphysis is approached. It is this area, occupied largely by the sublingual gland, that is compressible because of muscular inactivity and thus affords us the greatest degree of effective peripheral seal whenever the denture periphery is accurately molded to the mouth floor at the proper level.

Let me here call attention to one of the most commonly practiced errors, failure to obtain good preliminary impressions. These, to be good, must cover a sufficient area. In Figure 3, we see that the specially designed tray extends well over the external oblique ridge, pushing the masseter and buccinator muscles out of the way. This enables us to get a well-defined impression of the ridge, permitting us later to make a vulcanite tray embracing the ridge accurately.

Figure 4 shows how the specially designed metal tray curves upward to get an impression of the forward face of the ramus. These two features are entirely lacking in any other tray that I have seen.

In Figure 5, we see the contrast between a common variety of tray and one

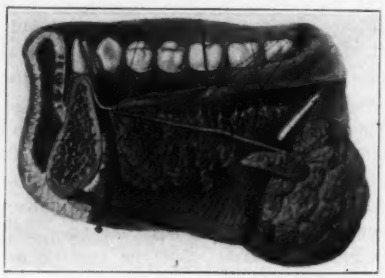

Fig. 2.—Floor of mouth.

properly designed. It is impossible to get an impression of the external oblique ridge with a tray the heels of which are sliced off at 45 degrees to the body of the tray.

Figure 6 is a diagram of the lower part of the mouth divided into areas in the rotation in which we approach them to make a final impression. Let us begin with Area 1. It is here that so many errors are made in creating the distobuccal angle and flange. The flange lies in the retromolar fossa and on and parallel to the external oblique ridge. If this flange is thin, with a round, smooth, thick periphery (not over 3 mm.), it can lie beneath the buccal fold in perfect physiologic comfort, provided the disto-

buccal angle, also round and smooth, does not distort the buccal fold from a straight line into one having an upward curve as it crosses the flange as shown in Figure 7.

lower dentures have the distal flange too high in Area 2 and therefore distort the fold into an upward curve, which is an indication of overextension, and soreness of the cheek will result. But it is

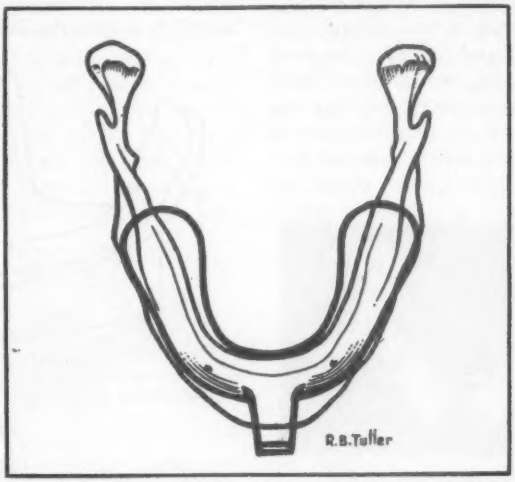

Fig. 3.—Drawing showing that the ramus does not rise behind the position to be occupied by the teeth and that a tray to secure a preliminary impression of the external oblique ridge must be so shaped that it can crowd both the buccinator and the masseter muscle out of the way.

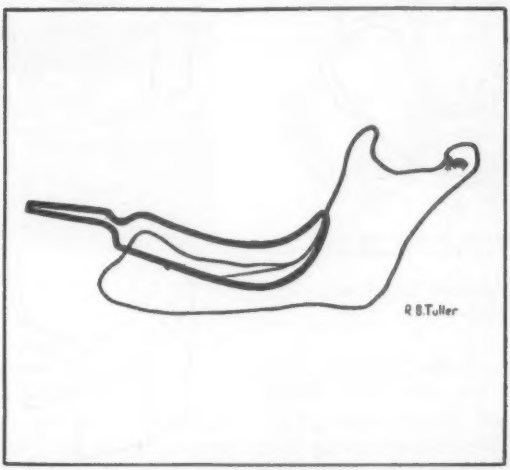

Fig. 4.—Drawing showing that the tray must be long enough and turned up at the heels to secure a good imprint of the face of the ramus. The tray must be heavy and rigid, but not unadaptable.

Figure 8 shows a diagram of the way the fold normally crosses the distobuccal flange in a straight line. Too many

just as great an error to cut it too low or to make a 45 degree cut, because we then lose both the atmospheric seal and

horizontal stability. Occupation of the retromolar fossa and firm contact with the external oblique ridge are absolutely essential to maximum stability in a lower denture.

Let us look at Area 2, Figure 6. This is directly in front of the pterygomandibular ligament and just over the pear-shaped papilla seen in Figure 9. Here, the mistake is often made by those seeming to think that this is the ramus of extending the heel upward on the ligament. This error not only arrests the

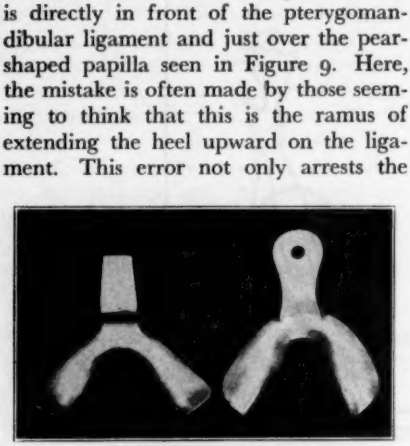

Fig. 5.—New tray (left) and standard tray.

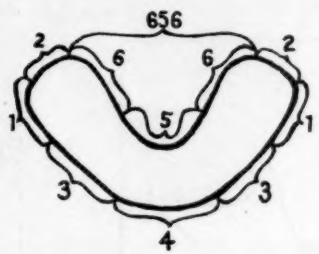

Fig. 6.—Areas involved in trimming tray and taking final impression.

natural activity of the ligament and creates soreness, but also often results in dislodgement of the denture. I have seen many otherwise excellent lower dentures that would not stay in position in function until the overextension onto the pterygomandibular ligament was reduced, after which they were perfectly stable. In Area 2, the height of the distolingual angle and heel can seldom exceed 1 mm. behind the pear-shaped papilla and is usually much lower. It should never exceed the height of the distobuccal angle.

We move now into Area 3, Figure 6, which is much misunderstood because dentists do not distinguish between the buccal fold and the buccal pouch. The

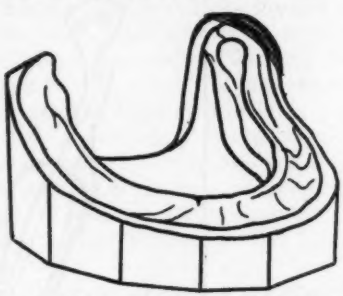

Fig. 7.—Diagram of buccal fold in distorted upward curved position as result of too great height of heel of denture in Area 2.

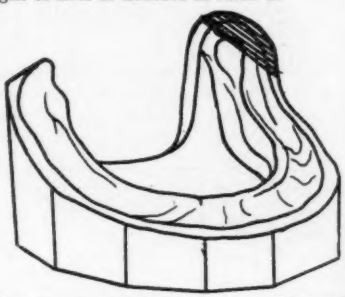

Fig. 8.—Buccal fold in normally straight line.

Fig. 9.—Pear-shaped papillae, one in profile and one full view.

flange of the denture does not enter the buccal pouch. Occupying the buccal pouch means overextension. It is wholly unnecessary for retention and

leads to the packing of food in the pouch in eating. The buccal flange in Area 3 has its periphery largely determined by the active flexion of the buccinator muscle and receives an atmospheric seal at the normal tissue flexion line. The width of the denture flange in Area 3 is considerably less than it is in Area 1. It is well to avoid the buccal pouch. Area 4 has its periphery laid at the tissue flexion line, which is formed by the puckering action of the obicularis oris muscle and extends labially far enough to maintain lip contact and a good atmospheric seal.

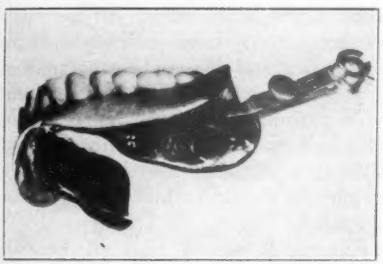

Fig. 10.—Misconception of Fournet-Tuller technic.

Fig. 11.—Correct application of Fournet-Tuller technic.

Certainly in no single area is so little of the possibilities comprehended as in Area 5. Here, as shown in Figure 10, the flange is usually too short to do its work properly. This is the major control area on the lingual flange, and the periphery, following the outline of the tissue contacts, should extend downward as deeply as it is possible to go and still give the tongue freedom to easily lick the lips from corner to corner, reach the roof of the slightly open mouth and have complete ease in talking and eating—and *this* is the measure of its depth. Figure 11 illustrates this condition. Most dentists do not realize that in Area 5, because of the absence of direct muscular contacts, adjustment of mouth floor levels to the depth requirements of the round, thick, smooth periphery is permitted, with physiologic tissue contact and a perfect atmospheric seal. To refer to Figure 2 again: When this seal is accomplished, a much shorter flange both vertically and horizontally is permitted in Area 6, the total result being

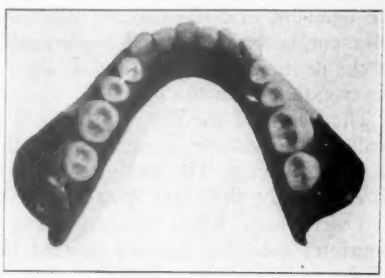

Fig. 12.—Correctly outlined Fournet-Tuller lower denture.

Fig. 13.—Dentures of different sizes with full-functioning peripheries and proper outlines, assuring equally satisfactory functioning.

complete tongue freedom with complete stability.

We now arrive at Area 6, which is probably molded incorrectly more often than any other flange. (Fig. 10.) This flange does not extend back into the throat, as I see so many attempt to make it do. It never should be extended distally more than halfway toward the distal border of the pear-shaped papilla and generally ends anteriorly to a line

drawn vertically downward from the distal border of the denture in Area 2. The total depth of flange is seldom more than one-fourth inch below the mylohyoid ridge and usually less. The thickness of the flange need not exceed 3 mm. and never needs to be 5 mm., as I see many made. When extended too far back, the flange interferes with free movement of the tongue in speech, interferes with swallowing and causes soreness, and when it is blended into overextended Area 2, there is a serious overextension onto the pterygomandibular ligament and the denture rides the ligament, both soreness and displacement of the denture often resulting. It should never extend onto the ligament.

The depth of the flange in Area 6 is really governed by the depth of the flange in Area 5. The deeper the flange in Area 5, the shallower Area 6 may be, and vice versa. When too deep, Area 6 interferes with the indirect upward lift of the mylohyoid muscle and, in a great many instances, a distinct notch must be created for its free movement when the tongue is thrust into the cheek. To refer again to Figure 11: The presence or absence of this notch often means the difference between success and failure. However, owing to anatomic variations, the notch is completely absent in many cases. The distolingual flange, then, is, we find, usually greatly overextended and too thick. Its importance as a retentive factor is greatly exaggerated.

Another mistake to avoid in Area 6 is having the flange enter the undercut beneath the mylohyoid ridge. This should be carefully avoided as it will cause intolerable soreness due to shortening the loop of the mylohyoid muscle and interfering with its free movement.

Among other common misunderstandings is that regarding the shape of the top or polished surface of the distobuccal flange. (Fig. 12.) Without destroying the round, thick, smooth edge of this flange, the top surface must be dished out so that the flange is thin, for the purpose of accommodating the thickening and increase of mass of the buccinator muscle upon contraction. If this is not done, pinching and bruising of the cheek will frequently result when the mouth is closed, and this is often mistaken for cheek-biting, although the teeth are not involved. The author finds that a large-size egg-shaped vulcanite bur is the most suitable tool for dishing out this flange, which, of course, should be carefully polished afterwards.

Perhaps the most common error that dentists make on all lower dentures is to produce thin knife edges. All successful dentures must have full functioning peripheries, and this can be accomplished only with carefully molded muscle and tissue peripheries that are about 3 mm. thick and round, and smoothly polished. After all adjustments are complete, these peripheries should be buffed to a metal-like polish.

Perhaps it would be well here to answer an often expressed query as to how we adapt a lower denture to knife-edge ridges. We do not even try. We enlist the services of a dental surgeon to make ridges round. It is my opinion that no technic will ever be devised that will enable knife edges of bone to support mastication without cutting through the supporting membrane.

Another misconception that has been fostered by some of our critics is that the size of the jaw affects resistance to lower denture displacement. (Fig. 13.) If we remember that the force applied is proportionate to the size of the anatomic structure, we will see that the small one will successfully resist every displacing force that this patient can apply. It will do exactly as well in the small mouth as the large one will do in the large mouth. This small case has been successfully worn for more than four years by a woman who is now 77 years old; which incidentally disposes of the assertion that it cannot be done for elderly women.

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METASTATIC CARCINOMA OF THE MANDIBLE

By Leo Stern, D.D.S., and Alfred Shepard, D.D.S., New York, N. Y.

SURVEYS dealing with the distribution of malignant neoplasms continue to indicate a high incidence of cancer in the oral cavity. The mean figure of a number of recent analyses ascribes 7 per cent of all carcinoma carcinoma of the jaws, contends that this condition is not so rare as it appears to be, asserting that a more thorough study of metastasizing carcinomata might disclose more frequent invasion of the oral cavity.

Summary of Metastatic Involvement of Jaws

Number of Cases	Primary Site	Area of Metastasis	Reported by
1	Breast	Mandible	Sonntag
30	Thyroid	Mandible	Erhardt
1	Sigmoid	Mandible	Blum
1	Thyroid	Mandible	Blair and Ivy
1	Rectum	Jaws	Blair, Brown and Womack
2	Breast	Jaws	Blair, Brown and Womack
1	Lung	Jaws	Ivy and Curtiss (from Dudet)
1	Bronchus	Maxilla	Stern and Gottlieb
6	Lip	Jaw	Geschichter and Copeland
1	Lip	Jaw	Thoma
1	Breast	Jaw	Thoma
1	Breast	Mandible	Thoma
1	Prostate	Mandible	Thoma
1	Prostate	Mandible	Thoma
1	Thyroid (benign)	Mandible	Thoma
1	Breast	Jaw	Thoma
1	Nasal mucous membrane	Jaw	Geschichter and Copeland
1	Prostate	Mandible	Geschichter and Copeland
1	Thyroid	Mandible	Geschichter and Copeland
1	Rectum	Mandible	Ivy and Curtiss

deaths to neoplasms of the mouth. The lesions encountered clinically are generally primary, occurring with greatest frequency, according to Cecil, on the surface of the tongue, the lip or the cheek.

Few references to metastatic involvement of the jaws are noted in the literature. The accompanying table summarizes these reports.

Thoma, in a recent study of central

In a series of 374 cases of primary carcinoma of the lung, Ewing, as reported by Adler, found that fifty-seven cases showed metastases to bones, some of which were in the skull. According to Rabin, among more than 300 cases of carcinoma of the lung treated at the Mount Sinai Hospital, only one (reported by Stern and Gottlieb in 1938) secondarily involved the maxillary bones.

A new case of a bronchiogenic carcinoma with metastasis to the mandible is reported herewith.

*From the Surgical Service, Mount Sinai Hospital.

REPORT OF CASE

History.—D. S., a grocer, aged 50, entered the hospital with a history of pain in the chest of increasing intensity, radiating to the left side and axilla, of five months' duration. Simultaneously, his voice became hoarse.

Fig. 1.—Clinical appearance of lesion.

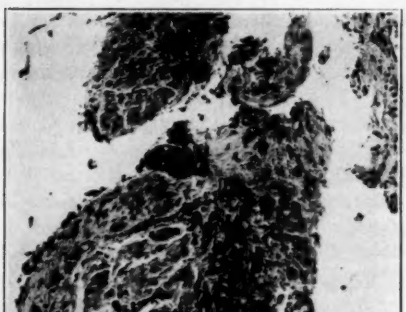

Fig. 2.—Section from tumor in lung.

Three months before admission, he noted additional symptoms, consisting of a slight cough and a pain in the right hip.

Since the onset of the illness, the patient had lost twenty pounds. Laryngeal biopsy two months previously was reported negative.

Physical Examination.—There was a moderate increase of retromanubrial dulness over the left lower lobe of the lung, posteriorly from the midclavicular line. Breath sounds were louder over the left lower lobe than elsewhere. Tenderness was noted over the lower portion of the trachea and the suprasternal notch. The left vocal cord resembled that of a cadaver.

There was marked limitation of motion of the right hip joint, with exquisite tenderness on pressure over the lateral aspect of the joint, just posterior to the greater trochanter.

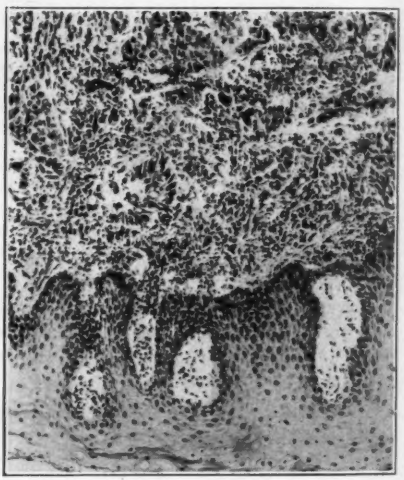

Fig. 3.—Section from tumor of mandible.

Bronchoscopy revealed a distortion and narrowing of the left lower main bronchus, from the presence of whitish, friable neoplastic tissue. Biopsy of the tissue from this region, reported by Dr. Otani, revealed infiltrating, anaplastic carcinoma.

Dental Notes.—The patient's teeth had been troubling him for several months. Two weeks before admission, a painful, loose tooth (the left mandibular second premolar) was removed by his dentist.

On dental examination at the Mount Sinai Hospital, many teeth were missing and the remainder appeared in a bad hygienic condition, and were somewhat mobile. A

tumor of walnut size was discovered at the site of the recent extraction. The mass was sessile, extending over the original margins of the tooth socket both buccally and lingually. It was an angry purplish red, not ulcerated, but painful to pressure, and nodular to palpation. Material was removed for a biopsy.

Roentgenographic examination disclosed a generalized resorption of the alveolar bone (periodontoclasia) and an unusually large area of bone rarefaction beneath the tumor.

Biopsy Report.—A section from the oral lesion showed a normal keratinized surface with slight infiltration of the squamous cell epithelium with carcinoma cells, while the subepithelial tissue contained innumerable carcinoma cells presenting numerous mitotic figures, and no differentiation (such as cell nests as seen in the prickle-cell type of carcinoma).

Since the epithelium was only slightly affected, while the connective tissue was severely infiltrated, it is concluded that the lesion is of central origin.

Course.—In three weeks, the growth had increased to the size of a lemon and several small areas of ulceration were noted. The area that had been incised for biopsy had healed completely under a surgical paste.

The patient was transferred to a nursing home and no further data regarding the subsequent history are available.

COMMENT

Central carcinoma of the jaws is not unknown, but occurs occasionally as a sequel to a tumor elsewhere. Although Dudet's account of metastasis from the lungs to the mouth is the first to be recorded, and Stern and Gottlieb reported the only other case noted, we surmise that this condition is more common than is believed. It seems significant that the present case is the second to be noted at the Mount Sinai Hospital within a few years.

As in the previous case, a painful tooth was removed just before the appearance of the oral lesion, and it is a matter of speculation whether the traumatism attending the extraction resulted in a predisposition to metastasis. It seems more likely that the growth of the secondary tumor caused loosening and pain in the tooth.

At any rate, it is obvious that, in patients suffering from carcinoma, the possibility of a metastatic lesion in the jaws should be considered, if a tooth suddenly becomes loose and painful.

SUMMARY

Besides the case of metastasis to the jaws from a bronchiogenic carcinoma here presented, only two cases have been reported in the recent literature. Nevertheless, metastatic involvement of the mouth by carcinoma is probably more frequent than the reports indicate. The routine use of dental roentgenograms in carcinomatous patients with loose or painful teeth, as well as more thorough examination of the jaws at necropsy, are likely to establish this as a fact.

BIBLIOGRAPHY

1. CECIL, R. L.: Textbook of Medicine, Philadelphia: W. P. Saunders Co., 1939, p. 677.

2. SONNTAG, E.: Beitrage zur Mund- und Kieferchirurgie. *Deutsche Ztschr. f. chir.*, 223: 222, 1930.

3. THOMA, K. H.: Clinical Pathology of Jaws. Springfield, Ill.: C. C. Thomas, 1934.

4. ERHARDT, O.: Zur Anatomie und Klinik der Struma Maligna. *Beitrage z. klin. chir.*, 35:343, 1902.

5. IVY, R. H., and CURTIS, L.: Metastasis of Tumor of Rectum to Mandible. *Ann. Dentistry*, 3:133, Sept. 1936.

6. STERN, LEO, and GOTTLIEB, M.: *J. Mt. Sinai Hosp.*, 4:452, January-February, 1938.

7. BLUM, THEODOR: Tumors of the Jaws. *D. Cosmos*, 73:745, August 1931.

8. BLAIR, V. P., and IVY, R. H.: Essentials of Oral Surgery. St. Louis: C. V. Mosby Co., 1936.

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PERIODONTAL SEPSIS IN RELATIONSHIP TO SYSTEMIC DISEASE

By Russell A. Sand, D.D.S., Fargo, N. D.

THE increased attendance at the sessions of the Section on Periodontia the past several years is very significant, since it reflects the way in which members of the dental profession are meeting their responsibilities. Dentistry, a comparatively young profession, has made almost unbelievable strides in its first century of existence as a profession largely because its members have met the challenge of increasing demands.

As members of this profession, we can be proud of the perfection that restorative technics have reached and of the developments that are taking place each day in that field. Having attained a high degree of perfection in the restoration of lost teeth and tooth structure, modern dentistry is turning more and more to the prevention of this loss. A patient, although grateful to a surgeon for the skilful removal of a limb and the subsequent provision for a functioning prosthesis, would be far more grateful to him could he have saved the lost member. The same holds true for the dentist who can save teeth the retention of which will not prove injurious to the patient's health. One of the most fertile fields in tooth preservation is that of the prevention and eradication of disease of the investing tissues. Probably, as many teeth are lost today through periodontoclasia as from caries, even though caries is often called the most nearly universal disease known to mankind. This being true, there is little wonder that interest in periodontia is constantly increasing.

The relationship of oral sepsis to systemic disease has undoubtedly more than any other single factor been responsible for elevating the profession of dentistry to its rightfully deserved place among the healing arts. When the theory of focal infection was proved, the dentist emerged from the class of technician or artisan to become the physician and surgeon of the mouth. Study of the pulpless tooth made the dentist more conscious of the importance of diagnosis and more careful as to what teeth he allowed to remain in a patient's mouth. It shall be my endeavor to show that disease of the investing tissue is of as great importance as or of greater importance than the pulpless tooth focus.

The pulpless tooth is the menace which first enters our mind in thinking of dental foci, and sometimes we overlook periodontal sepsis in an oral diagnosis. In my opinion, this periodontal sepsis is one of the most vicious foci with which we, as dentists, deal.

The very nature of the disease, a painless, chronic, seemingly innocent condition, almost brands it menace number one. Should we grant that every pulpless tooth is not infected, we must assume that every tooth affected periodontally is theoretically infected and must be treated or removed to eradicate the existing infection. Without attention, every periodontal lesion remains as a potential focus and, as such, its importance must not be underestimated in an oral

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diagnosis in the search for possible foci.

Just as it is easier for the physician to diagnose an acute appendicitis than a low-grade chronic one, it is easier for the dentist to diagnose an acute abscess of a tooth than a hidden chronic condition involving the supporting structures of the teeth. Most systemic diseases which might be caused or amplified by a dental focus are traceable to chronic, but active symptomless foci, since the acute, readily apparent foci are usually eradicated because of the discomfort that they cause locally. Thus, it behooves us in our diagnosis to be especially diligent in evaluating such obscure sources of infection.

In dealing with oral foci, many authors state that alveolar abscesses (usually referring to periapical abscesses) are of greater pathologic importance than periodontal lesions. To this statement, I take exception, chiefly on the basis of clinical experience, but considering laboratory theory as well. The chief arguments given are that periapical abscesses lack drainage; are usually symptomless, and therefore often overlooked; are subject to the pressure of mastication, which forces their bacterial inhabitants into the blood stream more readily, and, lastly, are blind and localized, and hence a more serious menace than those including soft tissue where expansion is possible.

Referring to these arguments: Periodontal lesions are both of the type that lacks drainage and the type that does not. Hence, transmission of septic material can take place (1) metastatically, (2) by direct extension through swallowing and (3) by transmission along mucous and serous surfaces. Considering that the gastro-intestinal membranes are merely a continuation of the oral membranes, we must place no little importance on the condition of the latter. Furthermore, since periodontal lesions are not walled off as are most periapical abscesses, infectious products are readily absorbed into the system. The contention that the alveolar abscess is less symptomatic and more readily overlooked by the patient seems a trifle absurd in consideration of the high percentage of patients who must be told by their dentist that they are suffering from periodontoclasia as compared with those who do not know that they have pulpless infected teeth. In consideration of the pressure of mastication, periodontally infected teeth are, if anything, of greater importance as foci, since the teeth thus affected are usually looser and therefore can mechanically pump more septic material into the circulation. The argument that periapical abscesses are blind and localized and therefore more severe than one that can expand seems slightly illogical, since an expanding area continually increases the area of absorption.

Bacteriologically, the periodontal lesion seems to present evidence of being as important a focus as we know. Superficial lesions show streptococci, staphylococci, pneumococci, diplococci, bacilli and amebae. Overlapping gingival disease often causes an association of fusiform bacilli and the spirochete of Vincent. Deeper areas disclose *Streptococcus viridans* and *S. hemolyticus, Staphylococcus aureus* and *Staph. albus* and amebae. To judge from the types of bacteria isolated from organs and tissue proved to be affected by remote areas of infection, it appears that gingival and periodontal lesions harbor an abundant crop of these same organisms. In general, periodontal lesions may harbor nearly all organisms found in the mouth normally, the difference being that, in such a condition of disease, these organisms have a much more fertile field in which to work and become more virulent.

Locations of foci usually given are the teeth and their investing tissues, the tonsils, the sinuses, the prostate gland and the cervix uteri. Of these, only the

periapical abscess has less drainage than the periodontal lesion. As the importance of the other possible foci is unquestioned, in all our studies and the practice of periodontia, the first and foremost consideration should be: Is the lesion affecting the health of the patient? If it could be, treatment should be governed accordingly.

For the present, then, let us assume that periodontal sepsis, at least theoretically, may be a factor in dealing with systemic disease. As a more practical approach to the question, I should like to give my own impression of observations from a ten-year association with a group of physicians in a private medical clinic. A follow-up of medical case histories of patients indicates that the following systemic ailments have been improved or eliminated by the removal of oral foci:

1. Chronic physical exhaustion, with characteristic malaise, weakness, nervous exhaustion and prostration on the slightest exertion; a generalized feeling that "the brakes are on at all times."

2. Vague chronic non-specific gastro-intestinal disturbances, which have appeared to be the commonest conditions responding to the eradication of periodontal sepsis.

3. Low-grade, mild appendicitis, cholecystitis, glomerulonephritis, chronic diarrhea and spastic constipation, which have responded well to the clearing up of periodontal disease.

4. Cases of arthritis, bursitis, myositis and dermatoses, such as acne.

5. Cases of subacute bacterial endocarditis and other heart lesions, traced to disease of the investing tissue.

6. Headaches of certain types. These cases have shown definite improvement after the elimination of periodontal sepsis and have probably been one of the best controls because, in most cases, no other treatment was instituted during the elimination of the foci except palliative sedatives. Many theories and arguments might be advanced as to how the elimination of sepsis could improve headaches. Several influences seem factual, however; i.e., in headaches arising from areas directly affected by oral sepsis, such as sinus, nasal and orbital areas. Another indirect effect of oral sepsis on headaches is arthritic involvement of vertebral structures, with associated myositis and bursitis. These conditions, which may cause pain at the base of the skull radiating upward along the skull, are many times due to oral sepsis, the removal of which often eliminates or immeasurably improves the symptoms. Auto-intoxication from intestinal stasis and other gastro-intestinal disturbances often causes headaches which can be overcome by the elimination of oral sepsis. In my experience, periodontal sepsis is more important than periapical sepsis in this regard.

In addition to those conditions already mentioned, we believe, from clinical experience in our group, that many other conditions are more or less directly due to chronic oral sepsis and that all non-specific diseases respond better to treatment when existing sepsis is eliminated.

It is virtually impossible, in a private institution, to use patients as controls, but it has been possible in enough cases for us to prove that the elimination of oral sepsis alone will clear up some cases of systemic disease. Neither has it been possible always to segregate purely periodontal from periapical sepsis, but we have been able to do so in enough cases out of several hundred to at least convince ourselves of its importance.

The procedure followed was to remove still vital, hopeless periodontally involved teeth, and to follow with the removal of non-vital infected teeth after determining a result from the first procedure. Only those cases were used in which overlapping medical treatment was negligible or not used at all. The

results of long-drawn-out periodontal treatment are harder to prove than the results of removal of hopelessly involved teeth because of the greater possibility for other treatment factors to confuse results.

Case histories are an effective means of illustrating the subject matter of any paper and proving one's point. I have dozens of histories on file to demonstrate what the removal of foci can accomplish in the conditions mentioned.

In the handling of any case of oral sepsis when the systemic condition of the patient is believed to be involved, several factors are extremely important in the eradication of such foci. Among the factors to be remembered are (1) age, (2) sex, (3) history of previous attacks, (4) duration and character of the disease, (5) heredity, (6) diet, climate and other extraneous conditions and (7) the last but the most important factor, the systemic tolerance and resistance of the patient.

In general, we should proceed slowly in the elimination of focal infection. If removal of teeth is necessary, only a few should be extracted at one time, the number depending on the severity of the local infection. Four is about the maximum. A postoperative flare-up of symptoms indicates the necessity for a longer intervening period before further extractions. Whenever possible, the sepsis is eliminated in one area, either maxillary or mandibular, right or left, at a time. I have found that removal of four teeth from one area, the lower right, for example, produces less shock than removal of two or three teeth in different areas. The best procedure is first to remove one tooth or treat one area until the patient's reaction to such treatment has been noted. When the resistance is low, it is best to build it up to a reasonable level before elimination of any chronic sepsis is attempted. In cases of acute disease, with a few exceptions, no attempts at elimination of sepsis should be made until the acute symptoms have subsided. If the local pain is intolerable, early elimination of the focus is essential. When acute pericoronal abscesses develop around third molars, there is much less systemic reaction, and a speedier recovery with fewer complications, if these teeth are removed promptly. We thus establish adequate drainage quickly, rather than employing the common, less effective method of incision over the affected area. I have seen more osteomyelitis and septicemia with high temperatures, pulse rate and leukocyte count when incisions have been made into acutely abscessed areas than in those cases where tooth removal provided rapid and complete drainage. These principles that I have mentioned apply to any oral focus as well as to those of a purely periodontal nature.

In dealing with periodontal sepsis exclusively, we must, more than with any hopeless periapical infection, be very selective in our treatment. When it appears evident that periodontal sepsis may be wholly or partially responsible for an existing systemic condition, the dentist, in consultation with the physician, should determine what method should be used in eliminating the focus. We have all noted the flare-up of constitutional symptoms following removal of an infected tooth. It is short lived in most cases, since the patient's defenses come to the rescue rapidly and liberation of micro-organisms comes from one insult.

Successive curettage of deep periodontal pockets, however, produces a shock at each operation, somewhat the same as if these toxins were injected directly into the system. I have observed several cases in which each periodontal treatment instituted to save questionable teeth caused a flare-up of symptoms over a long period of time. The rule that I follow in eliminating periodontal

sepsis in individuals suffering from systemic disease which may be due to this focus is this: When there is suppuration present in well advanced lesions and the prognosis is at best questionable, the patient with little resistance is advised to have the teeth thus affected removed rather than take the risk of irreparable damage from repeated stirring up of infected areas.

CONCLUSION

I should like to say that it has not been my intention necessarily to weigh periapical sepsis against periodontal sepsis as an important focus, since both are potential foci. However, I cannot too strongly urge that the septic periodontal lesion not be underestimated as a focus of infection. Neither do I wish to seem radical in advising removal of teeth affected periodontally. The choice of a conservative or a radical procedure should be determined by our individual judgment. If lesions about the teeth can be successfully treated, instead of removing the teeth, by all means let them be treated. At all times, we must bear in mind that we are dealing with a tinder box of infection waiting to be touched off by the spark of lowered resistance. The science of periodontia blazed the trail in the pioneering venture of saving teeth. Let it continue this mission in restoring health and saving lives.

807 Broadway.

DENTISTRY'S CONTRIBUTION TO INTER-AMERICAN RELATIONS

By HARRY H. PIERSON, Washington, D. C.

A YEAR ago, my present chief, Mr. Charles A. Thomson, addressed this group of scientists.

Let me hark back for a moment to what he said in order to give our thought some continuity. You may recall that he directed your attention to the growing feeling throughout America that careful attention should be given to New World ties—a mutual desire to draw closer together politically, economically and culturally. Events of this year have heightened our belief that the course described is the wisest one to follow. You will also recall that, in fostering this movement, the Department of State and responsible private organizations in the field have sought to emphasize three things: education for basic understanding, reciprocity and cooperation.

Let us look first at the item of reciprocity; that is, the mutual recognition that each culture, north and south, has much to receive and much to give.

No one today really knows how much the other American republics have to offer to us of the United States culturally. I do not believe that a complete study of the subject has ever been made and set down in popular or learned form. Prejudices and misconceptions must first be cleared away and an objective and receptive attitude must take their place.

We must not think that merely be-

From the Division of Cultural Relations, Department of State.

Read at the annual meeting of the Pan American Odontological Association, New York, N. Y., December 4, 1940.

cause we have great endowed universities today in the United States, our present-day culture is built on an older foundation than that of Latin America. We forget that fifty years before the settlement of Jamestown, universities were in operation at Mexico City and Lima, and that during the eighteenth century many more institutions were established which ranked with those of Spain, a country whose universities were at that time the mecca of learning in Europe. Even during that century, less than half as many universities were established in Anglo-America as in Spanish America.

In his "Short History of the Americas," Professor Gotterill writes:

> In their curricula and equipment the Spanish colonial institutions were apparently superior to those in British America. Philosophy and divinity were the chief studies, but medicine was well taught, and considerable attention was given to botany, mineralogy and ethnology. The British colonial colleges were little better than grammar schools. . . . The University of Pennsylvania was apparently the only institution of higher learning in America with a modern course of study.

The same author avers with reason that "in the field of fine arts the cultural achievements of Latin America have been definitely superior to those of English America." He continues, "Every Latin American nation has its national academy of fine arts and national conservatory of music." Magnificent structures house the national theaters in Buenos Aires, Montevideo, Mexico City, Rio de Janeiro and other cities. Is it any wonder that we, whose system of government has until recently kept us as far removed as possible from anything that resembled government patronage of the arts, have until a very recent date been regarded culturally with a measure of disdain by our Latin American neighbors?

However, during the past several decades, the United States may be said to have experienced a golden age in the development of those sciences that guard the health of its people and the people of other nations. In one field above all has it established the reputation of having preeminent scientists, and I shall not surprise you in telling you that I refer to dentistry. Even in England and France, "American dentistry" has been in highest repute. In Latin America, the names of our leading dental schools are proudly engraved on large copper plates outside the street doors of many prominent odontologists, and often one has his teeth examined in an American dental chair while, over the shoulder of the dentist, he sees an American diploma occupying a place of honor on the wall.

But this is the exception rather than the rule. As you all know, Latin America has its own dental schools and most of them can be said to turn out men who are a credit to the profession. According to information collected in the Department of State, there are at present at least twenty-eight recognized dental schools in sixteen countries.

Many active dental societies—about fifty—contribute to raising the level of dental instruction in those countries. Some of the national societies have banded together to form the Latin American Odontological Federation, which meets every five years in the various South American capitals. When one stops to think that Latin America means twenty republics from the Rio Grande to Cape Horn with a combined area twice as large as that of the United States and about the same population, and separated from each other by great geographical barriers, it will be realized that the Latin American Odontological Federation has gone a long way toward preparing the ground for complete inter-American federation in the field of dentistry.

Another point that I wish to emphasize while on this subject is the broad cultural outlook of many dentists in the other American countries. Exemplifying this is a dentist I know in Colombia who is one of the best known practitioners and at the same time a prominent playwright. This broad outlook on the finer things of life is no doubt due to a system of education which has been tremendously influenced by French philosophy and thought. Cooperation between the United States and her Latin American neighbors would perhaps have come earlier in our history had we been imbued as a nation with a deeper cultural consciousness, along with our great technologic advance. That the day is rapidly coming when such will generally be the case is, I believe, certain. That it is already upon us as far as dentistry is concerned is shown by the purposes of the Pan American Odontological Association.

As I said a few moments ago, one of the fundamentals in the development of closer inter-American relations is the mutual recognition that each culture has much to receive and much to give. The question is, therefore, to find out what aspects of the culture of each continent have developed to a point where they can be shared with the other, and what aspects are still in the stage where they will benefit from a more advanced experience. Every one, I believe, recognizes that in "adding up the score," there will be no disputing the fact that there is one field in which the United States can be a "giving" rather than a "receiving" nation, and that field is dentistry in all its branches. And since the Pan American Odontological Association represents a cross-section of American odontologic endeavor, this group can contribute most effectively to the achievement of a greater sense of continental unity in scientific thought.

What has been done and what remains to be done in inter-American dental relations? As I suggested above, many Latin Americans have come north for their dental education, and in so doing have had to overcome enormous barriers of language, new environment, monetary exchange difficulties and perhaps an inadequate training in the basic sciences. Through several lines of endeavor, our North American dentists have been extending the friendly hand to facilitate this movement and bring to the United States the best qualified young men of the other American republics. The fellowships and scholarships offered through your association by some of our best schools of dentistry and those offered by dental circles on the west coast are signposts pointing the way to broader highways of cooperation. I am sure that a program of fellowships and scholarships carefully managed will convince us that this is the proper approach to the problems of raising dental standards throughout the continent. The Department of State is ready to cooperate in this movement in every feasible way. As you know, it already administers the graduate fellowships and professorships provided for in the treaty signed at Buenos Aires four years ago this month. The Pan American Odontological Association can assist by stimulating qualified graduate students in the other American republics and in the United States to apply for these fellowships. Those coming north could take courses in specialization at our universities; those going south could study some of the basic conditions in dental practice in those countries that are essential to a proper undestanding of the problem of interchange. Who are the great odontologists of Latin America? What courses are taught in the dental schools and what methods are used to teach them? What is the place of the dentist in Latin American society and what influence does he have in his com-

munity? These are only a few of the many questions that a mature student could investigate.

In addition to these fellowships, the Department of State has been granted a modest sum to provide assistance to worthy students from the other American republics and from the United States who have obtained fellowships to study in a university in the other area, but who are prevented from accepting the fellowship by the high cost of travel. It is not our desire to make it too easy for these students, as we believe that they must contribute something personally if they are to get anything from their studies; but all of us know of cases which deserve the utmost sympathy and wherein, we might say, "a little money would go a long way." It is hoped that the sum for travel grants will be renewed during coming fiscal years and that among those applying for assistance will be a representative group of dental students.

The treaty to which I referred previously also provides for what amounts to an annual exchange of visiting professors with the other participating countries. In the same way, no limitation is placed on the field of interest, and we therefore hope that some of our outstanding professors of dental subjects will find it possible to apply for these professorships. Much might be done above and beyond the treaty, however, to foster this exchange. Your association could form a signal service by establishing a few important visiting professorships to be availed of by our teachers, perhaps during their sabbatical leaves of absence, who could take up residence at Latin American schools for extended periods of time.

A further means of cooperating with our Latin American cousins and one which has, I believe, promising possibilities, is the establishment of short courses and so-called "refresher" courses for more mature persons who wish to improve or replenish their knowledge of specialized subjects. Many busy professional men, who find it difficult to remain away from their offices for more than a month or two, would undoubtedly be attracted by shorter but more intensive courses in certain branches of dental science. Special steamship rates for sizeable groups might be obtained, which would enable a larger number to take advantage of the courses.

We have considered several ways in which dental education can be of assistance. Before leaving the subject, I wish to emphasize one point that experience has proved to be most important. If the suggested opportunities do develop and can be coordinated by the Pan American Odontological Association, they should be brought to the attention of Latin American dentists in printed form in their own languages well enough in advance to ensure their obtaining ample publicity and to allow time for proper selection, which is, of course, vitally important both to the student and to the institution which is to receive him.

It might not be amiss at this point to remind you that Portuguese, spoken in Brazil, is the language of a vital and growing people who now number about 40,000,000, or about one-third the population of all Latin America. It is therefore important to give this language its proper place alongside Spanish, and still more important to see that any approach to Brazilian dentists is made in their own language.

The establishment of traveling clinics is another of your objectives which has tremendous possibilities. Some work has already been done, as you may know, by members of the Alumni Association of the College of Physicians and Surgeons of San Francisco, and perhaps by your own members. The San Francisco group has made several trips to Mexico,

and at least one trip to the South American continent and has, I believe, taken motion pictures of their activities. If such work could be recognized by the American Dental Association and supplemented and extended by the Pan American Odontological Association, a noteworthy contribution to interamerican dentistry would result.

There is still another field in which the Department has felt the need of assistance by a private group such as yours, and that is in hospitality for visiting dentists. Often, an eminent dental scientist from Latin America will come to the United States to study our methods and will be completely at a loss, through lack of knowledge of our language or our institutions, as to where to go and what to see. Efforts are being made in the Department to bring about a greater degree of cooperation in the realm of hospitality, and it is hoped that, at a not distant date, it will be possible to obtain in advance the names of visiting Latin Americans who have distinguished themselves in specific fields or are looked on as future leaders in those fields, and to pass these names along to properly qualified organizations, which can arrange for expression of personal and professional hospitality, visits to centers of scientific interest, etc. We know that in this we can count on the full cooperation of the Pan American Odontological Association.

A final suggestion that I have to make concerns the dissemination of scientific information through the motion picture and the printed page. Personal contact through professorships, clinics, etc., is often too expensive to cover wide areas, and the only means of bringing the latest advances of science to professional groups is the cinema or published information. The American Dental Association has made films and literature available, but this has necessarily been done as the supply of both these media for circulation in the United States permitted its release for use in the other American republics. As far as I know, no coordinated program for the dissemination of information in the languages of our neighbors has been undertaken. No program has been planned for the periodical sound-tracking of dental films or the regular translation of textbooks and articles by our outstanding scientists. Here again, the Pan American Odontological Association, acting as the catalyst for all efforts of American dentists in the inter-American field, can be of great importance and assistance.

The problems of America must be faced on the basis of common action and mutual responsibility. The bonds that unite the nations of this hemisphere are nowhere so strong as in the fields that better the health and prolong the lives of their citizens. The challenge to the Pan American Odontological Association is, therefore, obvious. Through its enlightened cooperation, joint international action against disease and ignorance can be reinforced and pushed forward more rapidly.

It is my hope, therefore, that the work of your group will continue to grow in scope and influence; that, through it, the efforts of every one who is interested or engaged in inter-American dental relations will be coordinated and extended, and that, whatever steps may seem appropriate to bring about a closer relationship, not only among odontologists personally, but also among the various national associations in the field of dentistry, will be taken in the not distant future. The time is ripe. The opportunity has only to be seized. The common ideal will overcome the barriers of nationalism, race and language. I believe that the Association can move forward with the fullest confidence of popular and governmental interest and encouragement.

THE PUBLIC DENTAL HEALTH PROGRAM FROM THE VIEWPOINT OF THE DENTIST IN PRIVATE PRACTICE

By HAROLD W. OPPICE,* D.D.S., and HAROLD HILLENBRAND,* D.D.S., Chicago, Ill.

AS a basis for consideration of the public dental health program from the viewpoint of the dentist in private practice, it is fundamental that the dual responsibility of the dental health officer be immediately recognized. This dual responsibility arises out of two facts: (1) the public health dentist is an agent of goverment and (2), at the same time, he is a member of the dental profession. Both of these circumstances impose definite responsibilities on the dental health officer, and the success of his work rests largely on the efficiency with which he discharges this dual obligation.

If this obligation can be accurately pointed out, the sphere of beneficial influence and activity for the public health dentist should be rather definitely circumscribed. It will only remain, then, to show how this sphere of influence and activity can be enlarged through government, the organized dental profession, the public health dentist himself and the dentist in private practice.

This paper proposes to deal almost entirely with the problem of how the productive success of public health dentistry can be enlarged by a more intimate understanding of the attitudes of the private practitioner in dentistry. This will involve, of course, a discussion of the organized dental societies which represent the private practitioner in collective enterprises.

GOVERNMENT AND THE PUBLIC HEALTH DENTIST

The protection and promotion of the public health has long been recognized as a responsibility of government—local, state or national. In the United States, however, this responsibility has not been generally discharged in so systematic or adequate a manner as such other functions of government as the protection of property, the provision of means of communication, the administration of justice and education.[1]

This quotation, from "Social Security in America," is a fair statement of the public health officer's obligation to government and is, in addition, an indication of how much work there is to be done in this field. Out of this obligation "to protect and promote the public health" arise other, subordinate ones that must not rest lightly upon the public health dentist. The public health dentist, as an agent of government, is under the obligation to cooperate with other individuals and agencies in the government that have a legitimate interest in the public health. He is under the obligation to coordinate public dental health activities so that there will be an economical, efficient and productive expenditure of public funds. He is under the obligation to expand the value and service of public health dentistry in the interests of both community and individual general health and dental health.

*Chairman and secretary, respectively, of the National Health Program Committee of the American Dental Association.

Read at the annual meeting of the American Association of Public Health Dentists, Cleveland, Ohio, September 9, 1940.

THE PROFESSION AND THE PUBLIC HEALTH DENTIST

Still other obligations rest upon the public health dentist because he is a dentist and a member of a profession. The public health dentist is exempt from neither the spirit nor the letter of the code of ethics. He has duties and responsibilities to his fellow practitioners even though, superficially, he is not engaged in the general practice of dentistry. He has the obligation of serving the public to the full measure of his ability. He must participate in, and advance, the work of his organized profession.

The mere fact that the public health dentist is an agent of government does not free him from these obligations. Rather, it strengthens them because of the possibilities for leadership and achievement that are inherent in the opportunities of public health officers. There can be no real conflict between the public health dentist as an agent of government and the public health officer as a member of the dental profession. Upon complete compatibility of these two elements, the final success of the work must rest.

THE AMERICAN DENTAL ASSOCIATION AND THE PUBLIC HEALTH DENTIST

The public dental health officer, if considered in yet another way, may be said to be the agent of the dental profession in the attainment of the ideals for which it was organized. The American Dental Association reflects and reinforces the individual dentist's obligation as regards the dental health of the public. The public health dentist is the agent used by both the government and the profession to achieve that objective.

If this is accepted as an accurate statement of the fact, the views of the American Dental Association become important because they define the general limits within which the best efforts can be made. For some time now, the American Dental Association has been concerned with the relations, present and future, between dentistry and government. In an effort to place the common obligation to public dental health on a sound and practicable basis, the American Dental Association has formulated various principles and suggested various methods. With these, we are sure, this audience is conversant. Because of their importance, however, it may be well to review the stand of the American Dental Association in regard to an expanded national health program, for it is in that field that the dental health officer will seek and find new levels of productive service.

The American Dental Association has outlined a three-point program for a more effective attack on one of this country's most pressing problems in dental health: the prevention and control of dental diseases. This problem is of interest to every dentist, but it is most challenging to the practitioner of public health dentistry.

This program is based on a professional knowledge of the problems that are unique in the effort to control dental disease. It does not attempt the impossible by trying to overwhelm dental disease with reparative and restorative measures. It is planned to produce permanent benefits rather than superficial or immediate benefits of doubtful value. It enlists the services of the private practitioner, the specialist and those with technical training in the field of public dental health. It employs the scientific approach through prevention rather than through treatment. It utilizes existing facilities and assigns authority to those quarters in which it properly belongs.

This three-point program proposes: (1) an expanded and intensified program of dental research because it is only when the causes of disease are known that a fully informed campaign can be made for its prevention and control; (2) an enlarged program of dental health education for all groups, includ-

ing dentists, so that the benefits of the present knowledge of prevention and control may accrue to the public, and (3) a program of dental care for the indigent, particularly indigent children, when funds are made available for that purpose.

This, then, is the program which the American Dental Association has officially offered to the government as a basis upon which organized dentistry can participate in an expanded national health program. In addition, the American Dental Association has outlined methods by which such a program can be made effective, through federal, state and local governmental agencies.

THE PRIVATE PRACTITIONER AND THE PUBLIC HEALTH DENTIST

The average dentist in the United States is a white man, engaged in private practice, married, with two and four-tenths children. He owns a fairly well-worn Chevrolet and a home about which the bank still has something to say.

In the good old days of 1929, he was making about $80 a week. In the dark year of 1933, he got along on a little better than $40 a week. Now, he is feeling a little stronger, on $55 a week.[4] The average practitioner had a fairly hard time in getting started and he missed an occasional payment on his equipment. After he had been in practice for about seven years, his income began to approach the comfort level.

When the twentieth anniversary of his graduation came along, the average practitioner began to sense that his practice was slipping in an almost imperceptible way. It is about this time that he begins to worry about his weight and health and makes learned observations on diet and hygiene. He begins to wonder if he is slipping, changes political parties and tells others, although he doesn't really believe it himself, that he's "getting old."

The average practitioner once thought of specializing, probably in oral surgery, but nothing much came of it. He has not mentioned for several years now the fact that he really wanted to study medicine. He does not like night work, but does not know how to stop it, or thinks he is losing business if he has. His overhead is about 40 per cent of his gross income and his credit rating at the bank is no better than it should be. He has a part-time dental assistant and he does not pay her very much.

The average dentist admits that he has not kept up so well as he should have and pleads "lack of time." He always means to read his journals, but he does not get the wrappers off before another issue comes in. He thinks that a lot of the material in the dental journals is over his head and he always means to get a good text and brush up on some of the new theories. Needless to say, he never carries out this good intention.

He gets much of his information about dental progress from table clinics at dental meetings, which he attends when he is not too tired or when the bridge foursome is broken up for some reason or other. He gets the remainder of his dental information from the dental salesman, with whom he likes to chat to learn how his neighbors are making out. He knows that most of the statements and claims for new products are not quite so glowing as they sound, but he has always been easily sold on "time savers and short cuts," which never quite live up to the preliminary sales talk.

The average practitioner has copies of *Life* on his reception room table and they are several months old, not several years, as any quantity of old jokes would have one believe. He likes to look at the pictures, but thinks there is too much propaganda nowadays. He suspects that he is able to avoid being taken in by propaganda and feels a little sorry for the other chap who is not.

He thinks that there is "politics" in his dental society and he cannot understand why any one would want a job as

officer of a dental society. Yet he is greatly pleased when he is appointed to a committee in the dental society. He says that there is too much government spending, yet he likes to do a little "relief" dentistry because "it's better than sitting around." He believes dental societies should abolish all illegal advertising and he thinks the societies have the power to enforce laws. He does not believe that he would study dentistry again, but he cannot think of anything that he likes to do better. He hates to be introduced as Dr. So-and-So only to have some one explain that he "isn't really a doctor, only a dentist." He hates even more the old jokes about dentists. He is a great listener to the radio and keeps one in his office for "patients while they are waiting." He listens to an occasional speech, but almost always falls asleep before the speaker finishes. His feet, very often, hurt him except after thirty-six holes of golf, when they feel fine because of the exercise.

The average dentist has an "odd faith" that "selling" dentistry might help his income. He thinks that the sales talk the practice management experts pass out is pretty sound, but that it "wouldn't work" in his office. He is not quite sure what "socialized dentistry" is, but he is against it, probably because "there would be politics" in it. He would like a regular, predictable income, but he would hate working for anybody. He is against communism, although his definition of it would surprise Messrs. Stalin and Marx. He does work for children but, admittedly, does not care much about it. He is also a little careless in his children's dentistry because he is dealing with "only baby teeth."

He thinks something ought to be done about those who cannot pay for dental care, but he has no suggestions as to what should be done. He hates to recommend a toothpaste and methodically demolishes all of the "claims" that his patients hear over the radio. Yet he admits that radio advertising has made people what he calls "tooth conscious" or "dental health minded."

All in all, the average dentist is a pretty good American in a casual sort of way. He is a pretty good fisherman, shoots a respectable game of golf, likes a nip or two on occasions and smokes more cigarets than are good for him. He is going to quit drinking and smoking "pretty soon," but never does.

It is this very human bundle of contradictions, superstitions, likes, dislikes, failings and virtues that we call the average American dentist. He is a strange mixture of technical training and inexplicable whims; of a deadly cynicism and a remarkable faith; of good resolutions and tardy performance. It is to this man that the public health dentist must give his message. Is it any wonder, then, that the message is so often lost in the rush of daily routine and that only the leaders of the profession have a deep understanding of the motives and objectives that underlie public health dentistry?

The responsibility for this condition lies on both sides. Each has failed to make the right kind of effort to understand the other's problems. Each has taken for granted that the other was doing as well as could be expected without any outside help. It will be easier to change the habits and customs of a smaller group of public health dentists than it will be to change the routine-ridden, custom-built attitudes of the average practitioner. For this reason, it may be well to consider some of the things in which the public health dentist has not fully exploited his opportunity to enlist the attention, cooperation and aid of the dentist in private practice.

1. *Failure to State the Objectives of Public Health Dentistry.*—The first great failure of the public health dentist lies in not making the objectives and ambitions of public health dentistry unmistakably clear to the private practitioner.

We realize, of course, that there are innumerable articles in the literature on this subject because public health dentists are no less reluctant to get into print than any other kind. But a majority of these articles that explain the objectives of public health dentistry make one or more of the following errors: 1. They assume that all articles are carefully read and their contents remembered by the average man in practice. 2. They assume that the average practitioner is deeply interested in public health dentistry and has a competent technical background in the subject. 3. They give innumerable details without saying in so many plain words just what these details are meant to accomplish. 4. They do not integrate the rather specialized work of the public health dentist with those aspects of dentistry, such as private practice, that are more familiar to the average practitioner. 5. They do not say, repeatedly, what public health dentistry is trying to do and how the private practitioner can share in the efforts and results.

At the risk of being unfair to both sides, let us illustrate this point.

The public health dentist thinks of his problems and objectives in terms similar to the following: the percentage of boys and girls of different geographic location, color and age, classified according to (1) present dental need and oral disease and (2) past dental treatment.

The general practitioner thinks of the public health dentist as one who has been hired by the health department to teach children to brush their teeth and to send out picture books for the "kiddies" on dental health.

Neither conception is accurate, complete or intelligible to the other group. The responsibility for this condition rests, of course, with both sides. Its remedy, for the public health dentist, lies in a repetition of the objectives of public health dentistry. These objectives should be stated in terms interesting to, and comprehended by, the average practitioner. These objectives should include both the long range ones (such as the material diminution of dental disease in this country) and the immediate ones (such as a higher level of dental knowledge among the children of this nation.) If this is done, the private practitioner will gradually accumulate a background in public health dentistry. He will acquire enough knowledge to make decisions and form opinions for himself in this field. He will know enough to believe that the objectives of dentistry, in public health and in private practice, are essentially the same, although the methods of operation differ in details.

2. *Failure to Explain the Methods of Public Health Dentistry.*—Some private practitioners have an idea that the public health dentist wastes a good deal of time and money in such things as "toothbrush drills," "picture books," "classroom lectures," "poster contests" and "school examinations." The private practitioner, be it said to his credit, knows that there is much still to be explained about the relationship of oral hygiene to the incidence of dental caries. He thinks that much of the public health dentist's effort should be diverted to providing actual dental care.

This attitude of the private practitioner arises out of the fact that he does not understand the methods of the public health dentist, nor does he see the relationship between the methods and objectives of public health dentistry.

To explain these things, the public health dentist must retrace his steps much farther than he usually thinks necessary. Because he does not go back far enough, the private practitioner has built up an ill-founded suspicion of the methods of public health dentistry.

The public health dentist, to remedy this condition, must make the following points clear: (1) that almost every one has dental disease; (2) that it is financially impossible, at the present time, to provide actual dental care to remedy

these defects and that, this being true, (3) some other method must be devised to reduce dental disease. The methods that have been found by public health dentists, through long experience and experimentation, to be best are those that he uses at the present time. He employs every means of preventing dental defects in the hope of avoiding a piling up of dental disease in the future. He does most of his preventive work among children because it is obvious that the greatest number of defects can be prevented or controlled during the earlier years.

Now, in order to reach children, special methods must be employed. These are the methods that the public health dentist uses and they have been worked out with the aid of teachers, educators and psychologists. The object of these methods is not to teach the old fallacy that "a clean tooth never decays," nor does it specifically try to prevent a cavity forming in an individual molar. The object is larger than that. It is to fix the responsibility for care of the teeth upon the child; to draw attention to early defects and their recognition and correction, and to employ the best means now at hand to prevent destruction of the teeth.

It is the cumulative effect of such teaching that is the object of public health dentistry. If enough attention is drawn to the teeth during the years in which prevention and care are most effective, a reduction in dental disease in this country must result.

All of this, of course, is elementary to the public health dentist, but his failure to make it similarly elementary to the private practitioner is one of the reasons that he has not enlisted the full measure of cooperation from the dentist in private practice.

3. *Failure to Explain Graphically the Results of Public Health Dentistry.*—One of the great difficulties of public health dentistry is to be found in measuring the results that are achieved by it. It is difficult, for example, to report the actual, concrete results of 200 classroom lectures. The actual results may be inestimably far-reaching, exerting a beneficial influence for many years. But how is this to be put down in black and white? Usually, it is done by recording the number of classroom lectures. Such a report means nothing to the average dentist and is, in addition, dull and uninteresting. The average dentist's background in this field is sketchy and he becomes impatient with this type of reading and soon discontinues it.

The remedy lies in a study of the pictorial and graphic methods of presenting statistics and similar findings. Tables and charts should be made more vital and graphic through the use of pictorial statistics, so easily grasped even by him "who reads and runs." The work of Neurath[5] in this field will particularly repay the study of the public health dentist.

4. *Failure to Dissociate Public Health Dentistry from Politics.*—The average man, as well as the average dentist, is suspicious of politics and politicians for reasons that should be obvious to any one who has read newspapers during his lifetime. The public health dentist unwittingly has some of this suspicion directed at him because his job is essentially a governmental one. The average practitioner remembers a few stories about his "county hospital" and confuses everything, until there is a definite stigma of politics on any one who is in a governmental health service.

That this attitude is not justified need not be asserted here. But what must be done is to overcome this false conception in the minds of the average practitioner; and until this is done, the work of the public health dentist is under an unnecessary and severe handicap. The remedy lies in the public health dentist's own weapon—education. The average dentist must be taught that the "political" public health dentist is the exception and

not the rule, and that there are any number of examples that can be cited to support this statement. The high morale of such public dental health agencies as the Dental Division of the United States Public Health Service is an ever-present contradiction of the accusation of "politics." A willingness to work with and through organized dentistry and its representatives will also do much to allay this fear of "political control" or intervention that is present in the minds of many dentists.

5. *Failure to Work Fully with the Organized Profession.*—The public health dentist can assume an unnecessary burden in his work by failing to consult the organized profession. When one considers the difficulty of getting things accomplished by working through innumerable committees, this occasional attitude of the public health dentist becomes understandable, but it is not helpful.

The average dentist, lacking in background as we have seen, often looks to his dental society for protection against various evils which he imagines threaten him in his practice. By working with the organized profession, the public health dentist would take advantage of that fact. The public health dentist would aid in allaying the practitioner's fear of political control or intervention. He would be enlisting a powerful aid on the side of public health dentistry and he would be providing himself with a means of reaching the average practitioner.

Many public health officers do, of course, work closely with local and state dental societies. The extension of this policy cannot help bringing the private practitioner more and more into contact with public health dentistry.

These criticisms are meant to be neither captious nor personal. They are based on a fairly long observation, a rather intimate acquaintance with dental societies and dentists in practice and a thorough belief in the objectives and methods of public health dentistry. Finally, they are made by two who are themselves "average practitioners in the private practice of dentistry."

All of these criticisms may seem elementary to the experienced public health official, but they are the basis of a more or less chronic misunderstanding between public health dentists and private practitioners. The misunderstanding is not serious; but it is present. The remedy is education: education of the dentist to know and understand the objectives of public health dentistry; education of the dentist to recognize the achievements of public health dentistry; education of the dentist to recognize the potential value, to him and to the public, of successful public health dentistry; education of the dentist so that he will know his place and rôle in this great endeavor; education of the dentist to know that dental practice and public health dentistry are inseparably linked in an effort to advance the health of the public—an effort to which both groups have dedicated their services and their lives.

BIBLIOGRAPHY

1. Social Security in America. Washington: United States Printing Office, 1937, p. 327.

2. Dentistry and Government. Chicago: American Dental Association, 1940, pp. 19-20.

3. *Ibid.*, p. 18.

4. Economic Conditions in the Dental Profession, 1929-1937. National Income Section, Division of Economic Research, United States Department of Labor. Washington: U. S. Printing Office, 1939, p. 4.

5. NEURATH, OTTO: Modern Man in the Making. New York; Alfred A. Knopf, 1939.

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SPECIFIC NUTRITIONAL DEFICIENCY DISEASE

By Russell L. Haden, M.D., Cleveland, Ohio

THE pathologic changes in organs and tissues resulting from disease were long thought to be caused only be positive etiologic agents such as bacteria, toxins or tumors. Recently, it has been proved that disease is often the result of a lack of specific chemical substances necessary for the normal life and activity of cells. The function and structure of every tissue is dependent on an adequate supply and efficient utilization of essential nutritional elements. These necessary factors are (1) mineral salts, (2) vitamins and (3) certain substances formed from food by the action of secretions in the body. Specific nutritional deficiency disease results from a lack of one or more of the essential nutritional factors. Only one factor may be lacking. Often, several are deficient, a complex clinical picture resulting.

There are many specific nutritional elements. Probably every mineral salt found in the animal body has some definite function. The number of vitamins is constantly being increased. Little is known about the specific factors formed in the body from ingested food. A classic example of this group is the substance formed by the action of a specific secretion of the stomach on something taken in as food which the bone marrow must have to make normal red cells. In the absence of this substance, the bone marrow becomes filled with immature cells, and the patient becomes anemic. The more important specific nutritional factors from a clinical standpoint are listed in Table 1.

Almost any tissue in the body may become diseased as a result of the lack of one or more specific nutritional factors. The more common lesions observed and the systems involved are shown in Table 2. We should think of such variations from normal in the tissues and organs rather than of clinical entities such as beriberi and scurvy, which have long been recognized as deficiency diseases. A well-developed deficiency disease such as rickets or scurvy always represents an extreme deficiency which has been recognized only late in its course. The most important clinical problem is to recognize the deficiency early when the changes are slight and the disease is responsive to treatment.

When vitamins were first recognized, little was known about their chemical structure. Now all have been isolated in crystalline form and also synthesized. (Table 3.) Vitamin B, once considered a single substance, has been shown to be a complex made up of several separate substances. Thiamin, nicotinic acid, riboflavin and pyridoxin already have been separated from this complex and more are known to be present. Several substances closely related may have much the same function. Thus, several substances are known which have the calcifying property associated with vitamin D. These vary simply in intensity of activity and all belong to the same chemical group. Vitamin A and vitamin K also occur in several forms.

From the Cleveland Clinic.

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The specific nutritional elements function in different ways. Some may actually be incorporated in compounds formed in the body. Iron is necessary for the formation of hemoglobin and becomes part of the hemoglobin molecule. Iodine becomes part of the iodothyrin formed in the thyroid gland. Calcium and phosphorus become part of the bones and teeth. Vitamin D, which is necessary for normal calcification, does not actually become part of the bones and teeth, although necessary for their normal development. Likewise, thiamin, or vitamin B_1, unites in the body with phosphoric acid to make an enzyme necessary for the metabolism of sugar. The vitamins and mineral salts may interact. Vitamin D prepares the body fluids for the precipitation of calcium and phosphorus.

The pathologic changes in tissues resulting from a specific deficiency are well demonstrated in experimental animals

TABLE 1.—NUTRITIONAL FACTORS WITH A SPECIFIC FUNCTION

Factor	Specific Function
Calcium	Necessary for the formation of bone and teeth and for the function of nerve tissue
Phosphorus	Necessary for the formation of bone and teeth
Iodine	Necessary for the formation of the specific secretion of thyroid
Iron	Necessary for the formation of hemoglobin
Vitamin A	Necessary for the integrity of epithelial tissues
Vitamin B complex	
Thiamin (B_1)	Necessary for the integrity of nerve tissues
Nicotinic acid	Necessary for the integrity of dermal tissue
Riboflavin (B_2)	Necessary for growth
Pyridoxin (B_6)	Necessary for growth
Vitamin C	Necessary for integrity of endothelium of blood vessels and for framework of tissues
Vitamin D	Necessary for the normal metabolism of bone and teeth
Vitamin E	Necessary for normal reproduction
Vitamin K	Necessary for the formation of prothrombin
Erythrocyte-maturing factor (antipernicious anemia factor)	Necessary for the maturation of erythroblasts in bone marrow

TABLE 2.—SYSTEMS INVOLVED AND LESIONS OBSERVED IN DEFICIENCY DISEASE IN ADULTS

System	Lesions Observed as Manifestation of Deficiency
I. Skin and other epithelial tissues	(1) atrophy, (2) scaling, (3) dermatitis, (4) pigmentation, (5) ulceration, (6) cornification
II. Nervous system	A. Neuritis: (1) pain, (2) paresthesia, (3) weakness, (4) paralysis B. Degeneration of spinal cord: (1) lateral column, (2) posterior column C. Cerebral: (1) mental disturbances D. Disturbance of function: (1) tetany
III. Alimentary tract	(1) anorexia, (2) stomatitis, (3) glossitis, (4) atrophy of tongue, (5) achlorhydria, (6) loss of specific ferments, (7) diarrhea, (8) loss of tone of gastro-intestinal tract, (9) ulceration of intestine
IV. Hematopoietic system	(1) macrocytic anemia, (2) hypochromic anemia, (3) microcytic anemia
V. Vascular system	(1) hemorrhage, (2) easy bruising, (3) edema, (4) nutritional myocardial insufficiency
VI. Osseous system	(1) softening of bone, (2) caries of teeth, (3) pyorrhea

by a lack of vitamin A. The primary effect of a vitamin A deficiency is exerted on epithelial structures. The normal epithelium first atrophies, the basal cells proliferate and stratified, keratinizing epithelium is formed. The epithelium anywhere in the body may be involved. Changes are especially marked in the gingivae, the pelvis of the kidney and the cornea. The thickened, spongy epithelium is very apt to become infected. In the kidney, stones are often formed. In the gingivae, conditions are ideal for infection, with the constant presence of so many bacteria and of trauma from mastication. The teeth also are affected, owing to atrophy and metaplasia of the enamel-forming organ. Vitamin C deficiency is characterized by inability of the supporting tissues to produce and maintain intercellular substances. These substances include the matrices of bone, dentin and cartilage, as well as the cement substance necessary to maintain the integrity of vascular endothelium. In growing teeth, the formation of dentin ceases and the pulp becomes separated from the dentin by liquid, which may be interpreted as due to the continued production by the odontoblasts of a liquid product (Wolbach).

Any one organ or tissue may be affected by a number of different nutritional elements with varying manifestations. Thus, the teeth and supporting structures may be affected directly by a deficiency of (1) vitamins A, C and D and (2) calcium and phosphorus. A lack of vitamin A causes changes in the gingivae, with thickening of the epithelium and secondary infection. A lack of vitamin C affects the vessels of the gums, causing bleeding, and interferes with the normal structures of teeth and

TABLE 3.—CHEMICAL NATURE OF VITAMINS

Vitamin A	Beta-carotene
Vitamin B complex	(1) Thiamin
	(2) Nicotinic acid
	(3) Riboflavin
	(4) Pyridoxin and others
Vitamin C	Ascorbic acid
Vitamin D	Calciferol
Vitamin E	Alpha-tocopherol
Vitamin K	Methyl-phytyl-napthoquinone

TABLE 4.—CLINICAL CONDITIONS ASSOCIATED WITH SPECIFIC NUTRITIONAL DEFICIENCY

Nutritional Factor	Clinical Signs of Deficiency	Clinical Syndrome ("Disease")
Calcium	Increased nerve irritability; disturbance of bones and teeth	Tetany, rickets, dental caries
Phosphorus	Disturbances of bone and teeth	Rickets, dental caries
Iodine	Enlargement of thyroid	Colloid goiter
Iron	Anemia of hypochromic and often microcytic type	Hypochromic anemia
Vitamin A	Epithelial defects	Ophthalmia, urinary calculi, night blindness
Vitamin B complex		
Thiamin (B_1)	Neuritis, anorexia	Neuritis, beriberi
Nicotinic acid	Glossitis, stomatitis, dermatitis	Pellagra
Riboflavin (B_2)	Conjunctivitis and cracking at angles of mouth	
Pyridoxin (B_6)	Stunted growth and dermatitis in rats	"Rat pellagra"
Vitamin C	Hemorrhage due to vascular defects	Scurvy
Vitamin D	Softening of bone	Rickets
Vitamin E	Lack of reproduction	
Vitamin K	Deficiency of prothrombin	Pathologic hemorrhage
Antipernicious anemia factor	Glossitis, diarrhea, anemia of macrocytic type, degeneration of spinal cord	Pernicious anemia, subacute combined degeneration of spinal cord, sprue

bone. A lack of calcium, phosphorus and vitamin D affects in various ways the structure of both the teeth and the bones. Indirectly, the dental structures are dependent on the general health of the patient, which in turn is dependent on a normal nutritional status. For instance, the lack of the erythrocyte-maturing factor, or antipernicious anemia principle, leads to pernicious anemia, in which the nutrition of the dental structures may not be normal.

Very small amounts of most of the vitamins are required to supply the normal daily requirement. Probably about 1 mg. each of carotene (vitamin A), thiamin (vitamin B_1) and riboflavin (vitamin B_2) is needed for the adult to maintain normal nutrition. About 25 mg. of ascorbic acid (vitamin C) and nicotinic acid is needed.

One wonders if too much stress is not laid today on vitamin and mineral salt deficiency. It is true that people got along well years ago before such things were thought of. However, in the past twenty-five to fifty years, great changes have taken place in the kinds of food eaten, especially in the greater consumption of refined foods. This is well-illustrated with vitamin B_1 (thiamin). Baker, Wright and Drummond[1] estimate that, one hundred years ago, a normal adult consumed 600 units of thiamin

TABLE 5.—CLINICAL SIGNS AND SYMPTOMS SUGGESTIVE OF DEFICIENCY DISEASE*

1. Glossitis and stomatitis (nicotinic acid)
2. Atrophy of tongue (thiamin)
3. Redness of tongue (nicotinic acid)
4. Muscle weakness, paralysis and paresthesia (thiamin)
5. Dermatitis, atrophy and pigmentation of skin (nicotinic acid)
6. Cracking at angle of lips (riboflavin)
7. Unexplained edema (thiamin)
8. Pyorrhea and spongy gums (vitamin A and vitamin C)
9. Easy bruising (vitamin C)
10. Softening of bones and teeth (vitamin D, calcium and phosphorus)
11. Microcytic and hypochromic anemia (iron)
12. Macrocytic anemia (antipernicious anemia factor)
13. Degeneration of spinal cord (antipernicious anemia factor)

*Missing factor in parentheses.

TABLE 6.—FACTORS IN THE SUPPLY, ABSORPTION AND UTILIZATION OF SPECIFIC NUTRITIONAL ELEMENTS

1. Amount ingested or lost directly by vomiting
2. Needs of the body especially as influenced by pregnancy or other conditions increasing the need, such as hyperthyroidism
3. Impairment of absorption into blood stream by (a) achlorhydria, (b) hypometabolism, (c) infection and (d) vascular disease
4. Impairment of utilization in tissues by (a) disease, such as chronic nephritis, (b) hypometabolism, (c) infection and (d) vascular disease

In Table 4, the more important essential nutritional elements are summarized with the clinical signs of deficiency and the clinical syndrome produced by the deficiency. So often the clinical manifestations of a so-called deficiency disease are due to the lack of several essential factors. None of the symptoms is specific for any certain symptom, since this may result from other conditions. If any of the symptoms listed are present, however, the possibility of deficiency disease must be considered.

1. BAKER, A. B.; WRIGHT, M. D., and DRUMMOND, J. C.: Nutritive Value of Bread, *J. Soc. Chem. Ind.*, 56:191, June 1937.

each day from wheat flour alone. Now, the daily consumption of flour is much less and the flour is so refined that only about one-tenth as much thiamin is obtained.

Vitamin D probably is most commonly deficient in children because it has a limited distribution. It is essential for the normal development of teeth and bones. Such a deficiency is uncommon in adults. The vitamin B complex is the most common deficiency in adults because it is stored to only a limited extent and the intake often is deficient. Vitamin A is a common deficiency because it occurs for the most part in the more expensive foodstuffs such as butter, cream and green vegetables. Vitamin C seldom is deficient because citrus fruits are so generously taken. Vitamin E deficiency is uncommon.

Since all organs of the body may be involved in deficiency disease, the symptoms are manifold. Certain signs and symptoms, however, always suggest deficiency disease. (Table 5.) Among the more frequent and more suggestive symptoms are changes in the tongue, such as redness and atrophy, neuritis, edema not due to cardiorenal disease and anemia. Perhaps changes in the teeth and gums are the most common of all.

If a tissue that requires a specific nutritional factor does not get it, it is apparent that deficiency disease must result. Thus, a hypochromic anemia always follows a lack of iron, and signs of scurvy a lack of vitamin C. The occurrence of deficiency disease is greatly influenced, however, by the loss of food factors after ingestion by diarrhea or vomiting as well as by excessive needs occasioned by pregnancy, lactation and hyperthyroidism. Disease in the body may greatly influence the use of the specific nutritional factors by the body. Thus, lead poisoning is associated with neuritis and a hypochromic anemia. This is due to the fact that the lead prevents the nerves from utilizing thiamin and the bone marrow from using iron. A low metabolism or the presence of infection also greatly influences the utilization of all specific nutritional elements. The more important influencing factors in specific nutritional deficiency disease are listed in Table 6.

In treating deficiency disease, large amounts of the missing factors must usually be supplied. The foods most valuable for furnishing the specific nutritional factors are (1) liver, wheat germ and yeast for the vitamin B complex and the antipernicious anemia factor; (2) cod-liver oil for vitamin A and D, and (3) fruit juices for vitamin C. Milk contains large amounts of calcium. Iron and phosphorus are abundant in lean meat and egg yolk. The following daily intake should prevent nutritional deficiency disease:

Milk	½-1 quart
Eggs	1-2
Meat, fowl, or fish	1 serving
Butter	1 tablespoon
Vegetables	3 servings, including one green leafy vegetable
Fruits	2 servings, including one raw fruit

ILLUSTRATIVE CASES

Some of the clinical problems in specific nutritional deficiency disease may be illustrated by cases showing different phases of vitamin B deficiency.

CASE 1.—*Edema Due to Vitamin B_1 (Thiamin) Deficiency.—History.*—A lawyer, aged 27, had followed a reducing diet for boils. He had taken only small amounts of meat and grapefruit daily and lettuce occasionally. His weight had decreased 60 pounds. He then lost his appetite and later developed a generalized edema. There was no pain or other signs of a peripheral neuritis.

Examination.—There was marked generalized edema without hypertension or abnormal heart findings. The urine was negative and the plasma proteins were normal. The edema rapidly disappeared when a vitamin

B concentrate was prescribed, recurring later when medication was omitted. With an adequate diet, the symptoms have not recurred.

Comment.—The edema here was due to a deficient intake of vitamin B. This condition is known in the Orient as beriberi. Often, a neuritis occurs with the edema, but none was present here.

CASE 2.—*Neuritis Due to a Vitamin B_1 (Thiamin) Deficiency.—History.*—A business man, aged 25, had taken large amounts of alcohol for ten years. In the past year, he had developed weakness, tingling and numbness of the hands and feet and difficulty in walking. All the teeth had been removed one year previously and no dentures had been used. The bowels tended to be loose.

Examination.—The patient was 50 pounds underweight. The tongue showed no redness or atrophy. The legs were weak and the deep reflexes were diminished. The pulse was rapid. The test meal showed no free hydrochloric acid. There was well marked edema of the legs and tenderness on pressure.

Comment.—This patient had a well-marked peripheral neuritis as well as edema due to a lack of thiamin. The deficiency was due to a deficient intake of protective foods and the excessive use of alcohol, which increases the requirement for thiamin. The results of treatment are unknown.

CASE 3.—*Pellagra Due to Vitamin B (Nicotinic Acid) Deficiency.—History.*—A woman, aged 53, was admitted for thyroidectomy for hyperthyroidism. She had had an attack of fever two months before admission, without apparent cause.

Examination.—On admission, the fever was still present. The basal metabolic rate was plus 35 per cent. The tongue was clean, smooth and fiery red. The test meal showed no free hydrochloric acid. The fever disappeared with treatment.

Comment.—The redness of the tongue indicated a deficiency of nicotinic acid. After thyroidectomy, the patient became delirious and the redness of the tongue persisted. All the symptoms cleared up with administration of sodium nicotinate and liver extract. Here, the deficiency was probably precipitated by the hyperthyroidism, which necessitated a larger supply of the specific nutritional factors.

CASE 4.—*Vitamin B and Iron Deficiency. —History.*—A physician, aged 58, had had diarrhea for several years, considered to be due to ulcerative colitis. The test meal showed an anacidity. The complaint was pain on swallowing and a sore tongue. The diarrhea was still present. The stools are large, light in color and foamy.

Examination.—The tongue was clean and smooth. The masticating surface was deficient. The test meal showed no free hydrochloric acid. There was a marked hypochromic anemia (red cells, 4.86 millions; hemoglobin, 55 per cent; color index, 0.57).

Comment.—This patient had the clinical picture of sprue, which is due to a deficiency of the vitamin B complex. The soreness of the tongue was due to a deficiency disease also. The hypochromic anemia, due to an iron deficiency, occurs often with a vitamin B deficiency. This patient should respond to liver extract and iron.

CASE 5.—*Vitamin B (Riboflavin) Deficiency.—History.*—A Catholic sister, aged 51, for thirty years had had charge of the kitchens in a nursing home. For years, she had had no appetite and had eaten meats and vegetables only rarely. Her diet consisted largely of bread, milk, tea and coffee. She stated that she never sat down to eat.

Her present complaint was soreness of the lips, which had been red, painful and cracked for two years. The most marked lesions were always at the corners of the mouth. The tongue was often sore. The patient had had no paresthesia.

Examination.—The patient was overweight. There was ulceration with crusting at the angle of the lips. The lips were red and raw. The tongue was red and smooth. The Achilles reflex was absent and the vibratory sense was absent over both ankles. There was no anemia. A test meal showed only 10 degrees of free acid.

Comment.—The lesions of the lips and fissuring of the corners of the mouth were caused by a riboflavin deficiency, evidently due to a deficient food intake. The redness of the tongue suggested a nicotinic acid deficiency, the smoothness, a thiamin deficiency.

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THE CLINICAL ASPECTS OF MECHANICAL BRIDGE FIXATION

By David W. Phillips, D.D.S., Chicago, Ill.

THE mechanical principle that we have been employing in the past to retain fixed bridgework is archaic. Today, many still use the method of more than a generation ago, and depend on mere cement and friction for retention rather than upon the application of sound mechanics.

Fixed bridge retention is a problem today, even greater than it was years ago, when we did not hesitate to sacrifice the full enamel covering of teeth for crowns and even pulps for post crowns in order to provide generous opposing walls for the adhesion of cement.

Unfortunately, the requirement of the casting process of tapered cavity walls without undercuts, to facilitate withdrawal of the wax pattern from the cavity, facilitates also dislodgement of the cast retainer in the same way and places this process in direct opposition to genuine mechanical bridge fixation.

We have all seen instances in which this type of retention was inadequate for even an individual inlay, and much more in retentivity is required of a cast bridge retainer to overcome the displacement leverages exerted by pontics.

In recent years, the reaction to the uncertainty of conservative cast-inlay bridge attachments has been a tendency toward greater tooth coverage with gold, deepening and extending preparations in deference to the recognized weaknesses of cement-frictional bridge retention.

Pins and various grooves placed parallel to the direction of exit of castings from their preparations are used more, but these always require deepening or extending the preparations already made.

These and the other more complicated and extensive types of retainers regarded today as necessary with cement retention require more time and skill and greater sacrifice of tooth structure.

All these preparations, beyond the simple fundamental two and three-surface inlay types, still have the same inherent weakness: lack of mechanical resistance to displacement in the line of least resistance, the direction of exit from their preparations. The fact that all castings for the more difficult and destructive types of retainer preparations can be easily lifted from the teeth before cementation is evidence of their dependence for retention on the caprices of cement. Of all remnants of old-time dentistry, cement-frictional retention for bridgework is the most enduring sophism.

Mechanical fixation[1] as differentiated from retention by a weak intermediary material, cement (intermediary retention), represents the definite locking of simpler castings to less destructive preparations by a very small pin placed at a right angle to the direction of exit. Then the retainers are positively fixed and locked against displacement in every direction.

It is not to be inferred that even small cement-attached inlay retainers will always fail. We have all seen instances in which the most conservative inlay attachments have held valiantly for a surprising number of years. On the other hand,

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we have also seen repeated instances in which castings for the most mutilating types of preparations have loosened prematurely because the cement holding them failed.

Mechanical fixation adds certainty to the security of each type. When used in its fixed bridge application, the main purpose of this technic is to extend the use of conservative inlays in bridgework by quickly converting them to secure retainers.

Then, with the assurance afforded by mechanical retention, we can design our retainers in accordance with the more important considerations: the biologic requirements and the practical requirements of every-day dentistry; simplicity of preparation, and conservation of time, effort and tooth structure.

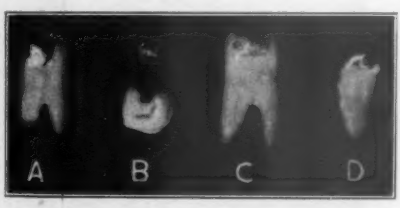

Fig. 1.—A, lock cavity prepared on buccal margin of molar inlay retainer. The circumference of the cavity below the surface is only about one-half of that shown on the surface for the beveled head of the pin. B, retentive notches in inlay and tooth which result from lock-cavity preparation. True mechanical fixation is apparent. C, finished lock pin in place. D, finished lock for bicuspid three-quarter crown. The addition of gold is negligible, only one-half of the pinhead and the resulting retentive outline forming on the proximal surface.

THE SIMPLE PHYSICS OF MECHANICAL FIXATION

The mechanical fixation technic merely represents the application of simple, sound engineering principles to the practice of dentistry, made possible and easily applicable by new devices for the successful reversal of precise inlay procedure.

It is now a comparatively simple matter to retain a bridge with conservative, biologic retainers of the G. V. Black or slice types so securely that, even if they were uncemented, the bridge could not be removed from its abutments until the tiny pin fixatives had been removed.

For centuries, man has locked one piece to another by using a pin to join them mechanically. This positive method of retention has been used in a million ways to retain almost anything: a door knob and a golf-club head, and it has even been used for coupling freight cars. The pin, to be effective, must always be placed at a right angle to the direction of exit of the part to be retained. Why not apply a similar simple principle to secure bridges with the same mechanical certainty?

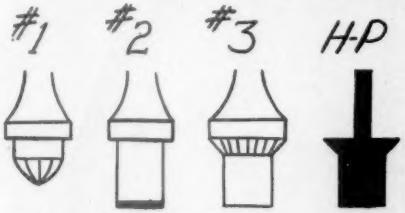

Fig. 2.—Diagrams of drills. 1, starter. 2, cylindricutter. 3, beveler. H-P, gold handle-pin.

We can, and by a slight modification of the basic mechanics of the means just mentioned we can adapt it to our work in a fashion that meets fully the biologic requirements, convenience and all other requirements imposed by the particular conditions under which we must operate. We should, and we can, establish genuine mechanical fixation superficially, near the surface of a tooth, on a cavo-surface margin, without deepening the area of preparation already made.

The well-known resistance of a hard-gold pin to shear represents the adaptation of the locking principle most easily and effectively applied to meet the ex-

1. PHILLIPS, D. W.: Positive Mechanical Bridge Fixation. J.A.D.A., 27:1418-1429, September 1940.

acting biologic requirement of superficiality in fixation.

With the simplest retainers, proximoclusal or mesioclusodistal (Fig. 1) as examples, a very small ready-made shallowly embedded precision pin with a beveled head is placed on its buccal or lingual margin on the proximal surface, half in the gold of the retainer and half in the tooth structure, 2 mm. or more from the gingival angle, perpendicularly to the surface of the tooth and inlay, and consequently also at right angles to the direction of exit of the casting from its preparation.

The little cylindrical beveled lock cavity, completely prepared with the engine, is only 1.75 mm. in depth and 1.25 mm. in diameter, and only half of it is cut in tooth structure.

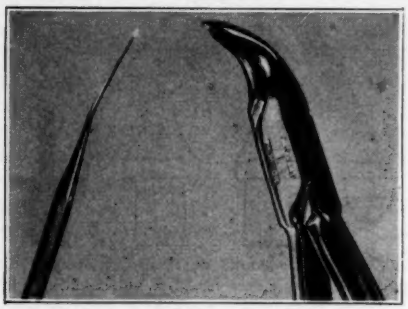

Fig. 3.—Handle-pin, gently grasped close to head, in ordinary rongeur, which is ideal for holding pin when cement is applied, placing it in the cavity for cementation and then pinching off handle the instant pin is seated. The root-canal plugger shown is used to apply the cement to the little lock cavity and the pin.

When the little lock pin is placed, the inlay cannot be removed without first removing or shearing the pin.

The addition of the lock creates another dovetail on the proximal surface in both outline form and function. Then any movement of the casting within or from its preparation is impossible in any direction.

Very significant is the increased power to resist torque, a dislodging force as effective as it is subtle.

I make no claims to having been the first to use this aged mechanical principle in dentistry. I know that many have attempted to apply it in the past, usually with ordinary burs and wire. The successful introduction of mechanical fixation awaited only the development of a technic mechanobiologically correct. Only the refined technic and the invention of the new type drills and the handle-pin that make it practical for dental use are new.

Surely the modern concept of dentistry goes far beyond the consideration of mere mechanics in retention, and now conservation of tooth structure, protection of pulps and more refined workmanship by simpler, standardized procedures are recognized as paramount objectives. Fortunately, this technic for improving the mechanics of fixation pays rich dividends biologically.

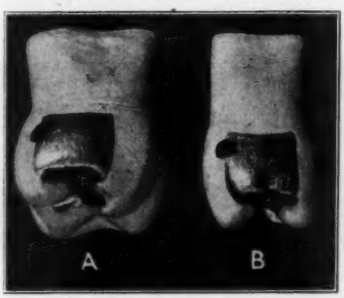

Fig. 4.—Preferred points for lock application to conservative bridge retainers black circles. A, mesioclusal view of mesioclusal retainer in upper right molar, locked on buccal margin. B, same aspect of mesioclusodistal casting in upper right bicuspid also locked on buccal margin on mesial surface.

This almost obvious method can be used to lock any casting that has a margin running parallel to its direction of exit. All bridge retainers except full crowns have one or more such margins on which superficial mechanical fixation

can be readily established. Later, a modification of this technic will be described for locking full crowns also.

THE METHOD IN GENERAL

Accurate and quick application of the superficial mechanical fixative depended on the development of the method and means for preparing lock cavities exactly to fit the preformed precision lock pins. A technic so practical has been evolved that already many are using it extensively to restore small one-surface cavities quickly with immediate gold inlays.

The three drills (Fig. 2) designed for this purpose, named in the order in which they are used, are:

1. The starter, No. 1, which has a round pointed cutting end to facilitate starting the lock cavity exactly centralized on the margin of the retainer, equally in the gold and the tooth structure. Its diameter is that of the pin. It has smooth sides to prevent cutting to a larger diameter A shoulder stops its cutting as soon as a shallow cavity has been prepared in which the next drill, a flat end-cutter, No. 2, can be placed and used without danger of creeping off center.

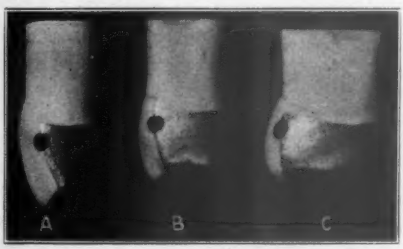

Fig. 5.—Manner of lock application to three-quarter crowns. A, upper right cuspid. B, bicuspid. C, molar.

2. The cylindricutter, No. 2, which exactly cuts the full cylindrical part of the cavity. This, being a non-sidecutter of pin diameter, also limits the diameter of the cavity to the diameter of the pin. In order that the depth also may be limited to the length of the pin, it has precisely spaced from its end a smooth shoulder which is stopped by the surface of the tooth and gold at the exact depth desired. Side slots permit the escape of débris.

3. The beveler, No. 3, which can cut the precision bevel of the cavity and absolutely no more. The smooth cylinder which extends from its center prevents all cutting in the cavity except the desired surface bevel and stops the cutting as soon as the bevel has been accurately cut to conform with the beveled head of the pin.

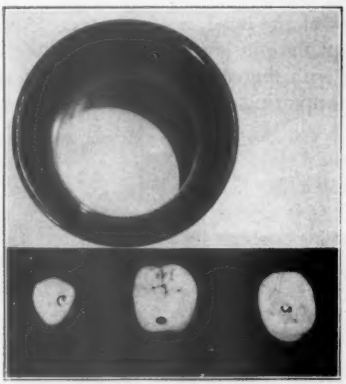

Fig. 6.—Typical immediate gold inlays by this technic. The jeweler's glass shown is provided to permit inspection of the margins under magnification at clinics.

There is no danger of cutting too deeply into any tooth with a matured pulp with any of these drills because each has a protective means for stopping its cutting as soon as the correct depth has been reached. Therefore, each drill is embedded to its utmost limit with some pressure at the end of the cut to make sure that the cavity is cut to its full, exact dimensions. For lock-cavity preparation, as for other preparations, only sharp burs should be used, especially in cutting enamel and hard gold.

One thing that contributed as much

as anything to making mechanical fixation practical in dentistry was the new type precision pin fixative, the little hard-gold handle-pin (Fig. 2, H-P). This preformed lock pin, accurate to a tolerance of one-thousandth inch, is provided with a slender handle extending from the center of its beveled head to facilitate manipulation of so small a piece. Without this handle, it is difficult to place the little pin in the cavity and almost impossible to remove it after the necessary verification of its fit in the cavity. Also, the difficulty of cementing so small an individual pin is eliminated by grasping its clean cement-free handle. The handle, well spaced from the margins of the head, is easily severed the instant the pin has been seated in the cavity with the cement, without any danger of impairing its marginal adaptation.

facilitate securing the best possible adaptation of the pin to the margin of the cavity.

The cylindrical part of the pin is now being made three-thousandths inch shorter than the depth of the cylindrical part of the cavity so that the end of the pin when in place cannot touch the floor of the cavity. Now it is stopped by the contact of its beveled head with the beveled margin of the cavity on the surface of the tooth to assure cavosurface adaptation.

Secondly, the diameter of the cylindrical part of the pin is now two-thousandths inch less than the diameter of the drills that cut that part of the cavity. This assures the escape of excess cement until the pin bevel comes in intimate contact with the tooth on the surface margin.

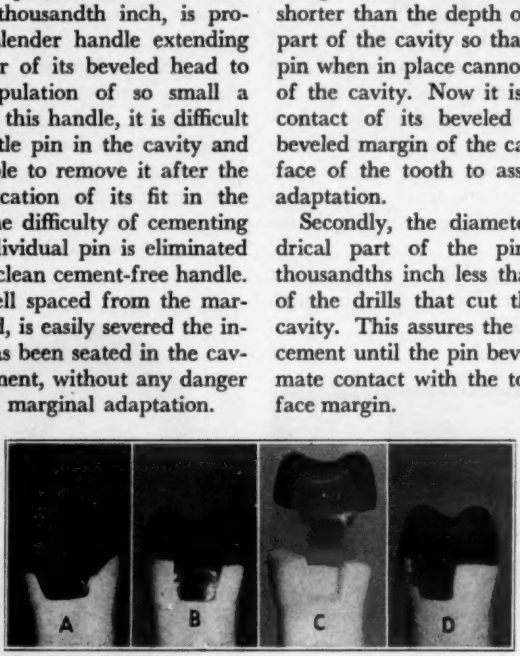

Fig. 7.—One of other uses of fixation technic: locking individual inlay to broken-down tooth with reduced, opposed, axially inclined walls. A, distal aspect revealing unretentive nature of remaining walls. B, mesial view showing lock-cavity preparation on longest, most favorable margin. C, same showing cuts resulting in casting and tooth. D, handle-pin in place for verification of fit. Such preparations are less destructive than those for full crowns. The castings are more easily made and well-fitted and have even greater retentivity when locked.

Now, with a little practice, the whole procedure of preparing the lock cavity, fitting and removing the fixative and cementing it may be carried out in precision style in a surprisingly short time.

TWO DELICATE IMPROVEMENTS

The foregoing explanation of the *modus operandi* of this technic has been given for clarity, but two further significant improvements were incorporated shortly after the original disclosure to

In addition, there have been two minor technical refinements: Now a little preparation on the retainer margin with the point of a very small tapered fissure bur is recommended to facilitate application of the starter, drill No. 1, and an ordinary rongeur which most dentists already have in their equipment, has been found equal to any small wire cutter that they might purchase for the purpose of holding the pin for cementation and then pinching off the handle in one quick operation (Fig. 3).

TECHNIC FOR LOCK CAVITY PREPARATION AND LOCK APPLICATION

Every operation essential to the construction of a good bridge should be completed and the bridge cemented to the teeth before preparation of the lock cavity is started.

The only operation performed after locking is cementation of the porcelain pontics to the bridge. Absence of the pontics affords better access for the entire locking operation. In some instances, the use of pontics with deep saddles placed in a buccal direction may necessitate cementation to the bridge before the bridge is cemented. Then any buccal or labial margins to be locked shall have been extended sufficiently for access.

We must be sure that the cement holding the retainers has set completely before starting lock preparation, to prevent unseating them. A sample of the cement mix is saved and tested for hardness with a sharp instrument.

The cemented inlay should be held tightly seated during lock-cavity preparation, preferably by the patient's occlusion against a small rubber block placed on the pontics or inlays. Here again, retention by cement cannot always be depended on.

All drills are held firmly, always at the same angle, perpendicularly to the surface of the tooth, carefully centralized on the margin of the casting to facilitate cutting the lock cavity equally into the gold and the tooth structure. Slice preparations may be locked just a little more toward the gold side.

The drills are pressed straight into the tooth with enough pressure to assure cutting the enamel and hard gold, especially in finishing the cut, to make sure that each drill has cut as far as its depth-limiting means permit. It is preferable always to place and replace the drills before the engine is started. The débris is always blown from the cavity and the drills cleaned between cuts.

The point of a very small tapered fissure bur is used to prepare for the starter on the margin of the casting 2 mm. or more from its gingival angle. Immediate inlay preparations may be started with the No. 1 drill.

Now we apply the starter drill, No. 1. Its cone-shaped cutting end enlarges the cavity gradually to permit inspection for centralization on the margin as the cut progresses.

The cylindricutter, No. 2, follows the starter and completes the full cylindrical part of the cavity. We must always drop or flow water on this No. 2 drill to dissipate the frictional heat for a quick, comfortable cut, being sure that the drill is sharp. It cuts most of the cavity and therefore dulls more easily than the others. The cut is finished with pressure of its shoulder against the tooth. Then the débris is blown from the cavity, the knives of the drill are cleaned, and this cut is repeated until the absence of débris on the knives proves that the cut has been completed to its accurate maximum. This also applies to the beveler, No. 3, used last.

If, in verifying the fit, the handle-pin does not seat itself to our satisfaction probably the cuts have not been completed as described. Then the cuts are repeated with the No. 2 and No. 3 drills as outlined.

Before the fit of the handle-pin is verified, the débris is blown forcibly from the cavity. Because of the accuracy with which the pin fits the cavity, the presence of débris can make an evident difference in its fit.

Cementation.—We use fairly thin cement, preferably mixed to set fairly quickly because the handle-pin technic permits pin placement, severance of the handle and final seating in time measured in seconds. To prevent obscuring the cavity for pin placement, just a little cement is placed with a root-canal plugger. The handle of the pin is grasped

gently in a rongeur (Fig. 3) or a small wire cutter, the cement applied, the pin placed in the cavity and the handle instantly pinched off. The pin is immediately seated firmly.

We should be sure that the cement holding the pin has set fully before grinding off the tiny nub left from the handle or burnishing the margins of the pin. For these purposes, only small, fine stones or sandpaper disks are used, preferably the latter whenever access permits.

When an individual gold inlay is to be locked for any purpose, if there is a tooth contacting the inlay surface to be locked, the cavity margins are extended sufficiently for access.

When margins to be locked require extension, the pontics may often be cemented before the bridge is.

Specific recommendations are given to facilitate speed as well as accuracy in this work. Though the technic is simple, merely applying three drills perpendicularly in the tooth until stopped by their depth-limiting means, the instructions should be faithfully observed without any abortive attempts at further short cuts. Properly executed, this technic is a veritable short cut to better dentistry. It should be employed the first few times for immediate gold inlays so that one can familiarize himself with it quickly in the easiest way.

PREFERRED POINTS OF LOCK APPLICATION FOR VARIOUS PREPARATIONS

Castings for posterior teeth (Fig. 4, A and B) are nearly always locked on the buccal margin of the mesial surface. These lock preparations are made with the straight handpiece. Molar inlays are never locked on the distal surfaces, but distoclusal inlays for bicuspid teeth may be locked on the buccal margin of the distal surface. The angle handpiece may be used for this purpose whenever the drills cannot be held at a true perpendicular to the surface of the tooth in the straight handpiece.

In molars, conditions sometimes warrant the use of a mesioclusobuccal retainer. One lock on the buccal margin of the mesial surface is usually sufficient for the retention of any bridge, but the retentivity of this inlay can be further augmented if desired by placing another lock on an axially inclined margin of the buccal surface.

All proximoclusal retainers, including those that receive the rest lugs of semifixed bridges, should be locked because, in this type of bridge, loosening of the unsoldered retainer presents greater difficulty than displacement of the soldered one with its pontic. Here, the retainer which receives the rest lug is always cemented first and conveniently locked before the major retainer and pontic are cemented.

The soldered retainer of a semifixed bridge is always locked on the surface adjacent to the pontic. The unsoldered retainer may be locked on either the mesial or the distal surface if, like a mesioclusodistal inlay, it includes both surfaces. Here, the mesial surface is chosen for convenience.

Retainers for bridges fixed at both ends resist displacement leverages with equal effectiveness when locked on either the mesial or the distal surface because, in this type of bridge, the most effective displacement forces apply leverage of the third class, the retainers at each end acting reciprocally as fulcrum and load. Here again, the mesial surface is selected for convenience.

A good anterior three-quarter crown (Fig. 5, A) can be made almost infallible as a bridge retainer by locking, even though the tooth for which it is made is shorter than average or the number of pontics that it must carry is greater than usual. Anterior three-quarter crowns may be locked with equal ease either mesially or distally. At times, it may be advisable to lock both margins of an anterior or bicuspid three-quarter crown on which much depends, if the axial

grooves are more divergent than usual. As the anterior part of the mouth is approached, the application of this technic becomes progressively easier.

Three-quarter crowns for bicuspid teeth (Fig. 5, B) may also be locked on either the mesial or the distal margin, though the mesial is usually preferred.

On the mesial margin of a molar three-quarter crown (Fig. 5, C), one lock is all that is ever needed. Though the method of locking posterior three-quarter crowns is described, these attachments can usually be supplanted by simple inlays if locked.

I have hesitated to express the full extent to which a precise proximoclusal inlay for a properly prepared cavity has proved successful when locked, even in cases with two pontics because, in the light of our past experiences, facts might be construed as gross overstatements. Frequently, conditions warrant the use of a proximoclusal inlay as a bridge retainer if it is mechanically locked.

Fortunately, because of the manner in which this technic is employed, the straight handpiece can usually be used for the locking technic, though the drills for the latch and angle handpieces are usually used for the preparations when the gold handlepins are used as immediate gold inlays.

I use a full crown retainer only when restoration of the tooth requires it or extreme susceptibility to caries renders it advisable.

For more than six years, I have not sacrificed the tooth structure necessary for the preparation of a full crown in deference to the requirement of retention alone. Locked conservative inlay retainers have also displaced the great majority of three-quarter crowns that I formerly made for posterior teeth.

Mechanical fixation so magnifies the retentivity of properly selected, well-executed inlay preparations that they can be depended on to retain securely a bridge of any span within biologic bounds. One lock on any preparation usually suffices.

IMMEDIATE GOLD INLAY CONSTRUCTION

Most operators will probably use this technic most often for immediate gold inlay construction. Because of its unusual simplicity, it should first be employed a few times as a steppingstone to the application of the mechanical fixation technic. Immediate gold inlay construction (Fig. 6) now affords the easiest and quickest way to permanent metallic restorations with fine marginal adaptation in small one-surface cavities on any accessible surface: buccal, lingual (except in incisors), occlusal and even proximal when adjacent teeth are not present. They are placed 2 mm. or more from the gingival line in teeth with matured pulps. These quick gold inlays also have economic advantages.

When immediately constructed inlays are placed in occlusal pits, before starting cavity preparation, the area around the pit is flattened with the flat end of a cylindrical fine stone, which is a little larger than the diameter of the shoulders of the drills to prevent the part of the cusps about the pit from stopping the drills too soon. The ground area is made smooth.

These immediate inlays may also be advantageously employed in partial denture work on the axial surfaces of teeth that afford neither anatomic nor positional undercuts to provide an undercut to receive the retentive bearing of a clasp.

For biologic reasons, we cannot make a retentive undercut in tooth structure and invite caries. But we can place this small immediate inlay at a point suitable for retention by the clasp and then cup its surface slightly to receive the retentive clasp bearing. Thus, without danger of caries at the gold-to-gold contact of the inlay and clasp, these teeth can be made amply retentive quickly and in a biologically superior manner. Only

a hard gold such as is used in the handle pin would serve here.

After the cement holding the pin inlay has set completely, its margins are properly finished. Then a very shallow retentive surface depression is ground in the center of the pin without approaching its margins, preferably with a small, fine stone.

Of course, this is completed before the impression is taken for the partial denture.

FURTHER USES OF THE FIXATION TECHNIC

The alert operator will find various ways and many opportunities to apply mechanical fixation in the field of operative dentistry and partial denture work as well as fixed bridgework; for example:

1. To lock a casting to a short tooth in which the length of the opposed axially inclined walls is insufficient to assure retention by cement, depending on its size in relation to the tooth and the stresses to which it may be subjected.

2. To lock cement-attached bridges that have come out before caries has set in. Many have informed me that they have been using mechanical fixation for the retention of all bridges since their success with this technic in retaining cement-attached bridges that had come out repeatedly before they were locked. Others started to fix their bridges mechanically to prevent a most unfortunate kind of bridge failure: the yielding of the cement holding only one retainer without dislodgement of the bridge. All of us know what this yielding of the cement entails. It occurs usually in retainers for the smaller teeth anterior to the molar region, where locks can be most easily applied to prevent it.

3. To retain inlays in teeth that are broken down, with the remaining axial walls so reduced as to make cement retention questionable (Fig. 7).

4. To retain very undestructive bite-opening inlays. Here, shallow preparations on the axial surfaces in posterior teeth can be made highly retentive though the entire occlusal surface is built up.

5. To lock all inlays the axial surfaces of which receive the retentive bearing of clasps. These inlays must resist the displacing forces of function and removal exerted by a partial denture. Because the success of this restoration is entirely dependent on the retentivity of this inlay to withstand these powerful dislodging forces, such inlays and even three-quarter crowns should always be locked to their abutments.

6. To lock small inlays, such as the proximoclusal, that receive the rest lugs of clasps. Because they must also receive the reciprocal bearing of the clasp, these inlays are subjected to any displacement force exerted by this bearing, especially when the partial denture is removed. When their ability to resist these forces is questioned, they should be locked.

7. To retain any inlay that is subject to displacement forces beyond the ordinary.

Repeatedly, I have had instances in which patients in need of partial dentures have had mouth conditions such that, for a successful partial denture, it was necessary to clasp a particular tooth remaining which was already so broken-down that the casting restoring it had to be locked if only to sustain itself. Mechanical fixation has made many of these inlays so secure that they have successfully retained clasps in addition, some as long as five years to date. I do not know how a partial denture would otherwise have been so readily practicable in these cases. Even full crowns for short broken-down teeth are not so retentive as mechanically locked inlays.

When a casting is to be locked for any of the foregoing purposes, we should remember to let the cement holding it completely set before starting lock preparation and allow the occlusion to assist in keeping it seated.

BRIDGE REMOVALS

There are two causes of many necessary bridge removals: (1) pulp disease, to facilitate root-canal treatment, and (2) the loosening of one attachment.

With this technic, the possibility of pulp disease is reduced by the use of more conservative preparations and a locked retainer does not loosen easily. Therefore, a locked bridge is less apt ever to require removal.

It is actually easier to remove a locked bridge than one merely attached by cement. The little lock pins are quickly drilled out with the first two drills used to prepare the lock cavity. Then the unlocked conservative inlays can be lifted from their prepared areas more easily than larger cement-attached retainers. Sometimes, it is helpful to trim the disto-buccal angle of the porcelain pontic to improve access. The same expedient often facilitates locking bridges formerly cement-attached that have come out.

THE OVERSIZE TECHNIC

A combination of precision drills and corresponding handle pins of slightly larger diameter than the regular, but of the same depth, called the oversize, has been provided for three purposes:

1. If one has erred so grossly that the lock cavity has been prepared entirely in either the gold or the tooth structure alone, correction by recentralization of the lock cavity on the margin can be quickly and easily accomplished. It is enlarged slightly by using the oversize set of drills in their regular order and manner, but with sufficient pressure on the starting drill toward the side necessary to recentralize the cavity on the margin. Of course, as always, the drills are held at a constant perpendicular to the surface of the tooth.

In this way, centralizing the cavity so that both the gold and the tooth structure can grip the pin is accomplished in a few moments. Then the corresponding oversize handle pin is placed in the usual manner. The oversize drills should rarely be necessary for the purpose just described. Perfect centralization is not absolutely necessary, but very definite cuts into both the gold and tooth structure are essential.

2. If, for any reason, it has been necessary to remove a locked bridge and the pins have been drilled out with the regular starter and cylindricutter drills, the oversize technic is very useful for restoring the locks precisely when the bridge is replaced if the drills had not been centralized on the head of the pin in removing it.

3. This oversize technic is useful in the immediate gold inlay construction technic. One may find, on opening the cavity with the regular drills, that caries requires its slight enlargement. Then the larger size is helpful. It is advisable to use the regular size except for the specific purposes mentioned above.

CONCLUSION

It would be presumptuous to submit any technic as the ultimate in the advancement of bridgework. Any step in technologic progress should always be regarded as purely ephemeral. The new of today is the obsolescent of tomorrow.

It will probably be a long time before the more conservative way is adopted by all who have accepted as a necessary evil the extra work and additional tooth mutilation entailed in the preparations that we have been using. Many of us have become so thoroughly inured to the hard way that the momentum of habit tends to carry us over the familiar paths of the past though they are more difficult.

We have all seen technics introduced, praised and then discarded as obsolete. No doubt some will have failures with this technic. It is not universally applicable.

I emphasize that it is just as necessary as ever to prepare cavities carefully, secure fine patterns, make precise cast-

ings and use good dental judgment.

About this technic, there is just one thing of which I am absolutely sure: it cannot be successfully employed to violate a single fundamental requirement of good dentistry. I hope that none will ever depend on locking to retain an unworthy casting. Instead, we should take advantage particularly of the opportunities simplification of retainer preparations affords to improve the excellence of our workmanship as well as the security of our bridges.

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FACTORS IN THE ACTION OF DRUGS OF INTEREST TO THE DENTIST

By FREDERIC C. MAYER, Ph.C., B.S., Milwaukee, Wis.

THE pharmacologist is interested in the influence of a drug itself, independently of its utilization. The physician and the dentist, on the other hand, seek to learn the influence of drugs in order that they may apply them as medicaments in the treatment of disease. In other words, they are interested in the therapeutic action. To understand this, however, they must familiarize themselves with the results of pharmacodynamic study. The physician or the dentist must know the effects of drugs upon healthy tissues and healthy organisms, and therefore most pharmacologic experiments are made on healthy animals and the results are those one would expect from the action of drugs on normal individuals. Dosage and pharmacologic actions are postulated from these experiments. If all persons to whom drugs are administered were healthy and normal in every way or reacted exactly alike to all drug influences, we could follow definite rules of dosage and administration of medicines in the treatment of disease. But there are many conditions outside the normal that modify the actions and dosages of drugs, such as age, sex, weight, climate, nationality, occupation, tolerance and intolerance. An attempt will be made to discuss briefly, from the pharmacologist's point of view, influences on the action of drugs of interest to the dentist.

It may appear to some that parts of this discussion are essentially medical rather than dental, but it must be remembered that many of the drugs regularly prescribed by the physician are also in general use in dental medicine.

It is the purpose of this paper to discuss the various conditions that modify the action of drugs. These concern the age, physical character and environment of the individual as well as the methods of administration and the peculiarities of the drugs and the individuals.

Read before the Section on Operative Dentistry, Materia Medica and Therapeutics at the Eighty-Second Annual Meeting of the American Dental Association, Cleveland, Ohio, September 12, 1940.

Jour. A.D.A., Vol. 28, May 1941

I. SIZE AND WEIGHT

It is assumed that the average weight of an adult is 150 pounds. Average doses of medicines as listed in the Pharmacopoeia of the United States, the National Formulary, books on pharmacology and therapeutics are based on this assumption.

In pharmacologic experimentation, it is customary to estimate the dosage in proportion to the weight of the animal, but, in actual dental practice, it is difficult to guess his weight correctly, and an expert would be required. Moreover, an adipose patient or a person with dropsy would have some excess weight, which would be difficult to estimate from a pharmacologic point of view. For these reasons and others, such as highly organized nervous systems, or the eating, drinking and working habits of the individual, the rule of dosage per weight is not always easy to apply. In the case of the more potent drugs, where the question of weight should be taken into consideration, Clark's rule may be applied. The rule may be stated as follows: adult dose $\times \frac{\text{weight}}{150}$. However, it is only in unusual cases that the dentist is called upon to apply this rule.

II. AGE

It is evident that young persons require less medicine than older ones for the same therapeutic effects. The reason for this is that younger tissue reacts more readily and also the weight of the young person is usually less. Many of the medicines intended for internal administration that a dentist is called upon to prescribe for conditions such as postoperative pain, premedication for anesthesia and other conditions are in the form of pills, tablets or capsules. It is impractical to divide and administer split doses of such preparations. When such split doses are necessary, in the case of children, prescriptions may be written by the dentist and Young's rule applied to determine the proper dosage for children. Young's rule may be stated as follows: $\frac{\text{age}}{\text{age plus } 12}$. This gives the fraction of the adult dose that should be administered.

It should also be mentioned that, in old age, the dose is, as a rule, somewhat less than in the prime of life. Especially, narcotics and depressant drugs should be administered with caution to elderly persons.

III. SEX

Women, chiefly because of their smaller size and also because of their greater sensitiveness, usually require smaller doses than men. Temporary conditions, such as nervousness, pregnancy, menstruation and lactation, may also determine the kind of medicine to be given and its dosage when administered during these periods. During pregnancy, violent or irritating cathartics and, during lactation, saline carthartics and narcotics should be avoided or administered cautiously. The dosage of drugs for women in general is about four-fifths as much as for men. In the administration of drugs that are ordinarily administered by the dentist, this difference between the dosage for women and that for men may usually be disregarded.

IV. TEMPERAMENT, RACE, OCCUPATION, HABITS OF LIFE AND CLIMATE

Persons of highly neurotic temperament usually react more readily to drugs than do those of phlegmatic nature. Some races are more excitable than others. For example, certain excitable individuals of one or the other of the Latin races may be more susceptible to the action of drugs than others belonging to the more stolid Nordic races. Out-of-door workers, such as loggers, teamsters, sailors, policemen, farmers and others engaged in hard physical work for years, especially accompanied by exposure to weather and hardships of greater or less severity, and who, because of the very nature of their work, become inured to hardships, develop a condition in which disturbing influences are little felt. Such persons are less affected by drugs than those of sedentary habits, such as office workers, teachers, students and artists. A life of refinement, luxury and indolence naturally tends to the production of softness and peculiar sensitiveness to disturb-

ances. Persons living such lives are therefore readily affected by drugs.

V. CUMULATIVE EFFECT OF DRUGS

Some drugs exert a cumulative effect. Such an effect may result when certain drugs are taken in therapeutic doses, but owing to some irregularity of absorption, as when excretion is slower than absorption, there may result an intensity of action such as is caused by a single large dose of the drug. Such a condition may occur with many drugs when kidney function is depressed. Drugs may accumulate in the body when absorption is irregular and they may be absorbed rapidly at one time, this giving the effect of an added or accumulated amount. Cumulative effect should, of course, not be confused with chronic poisoning. In the case of cumulative effect, as has been stated, the action is one similar to that from a single large dose of the drug, while there is a chronic effect when certain drugs are taken in therapeutic doses at frequent intervals and the effects are gradual and progressive. Such chronic effects are frequently found in occupational poisoning, such as may occur in plumbism or mercurialism. It should also be noted that successive doses of the drug sometimes lie unabsorbed in the alimentary canal until the conditions become favorable for absorption, when they may be taken into the system in a very short period of time, with a cumulative effect. Only certain drugs act in this manner with any kind of regularity.

VI. RAPIDITY OF ABSORPTION OF DRUGS

The time required for absorption into the body and into the cells varies greatly, from a few seconds, as in the case of hydrocyanic acid, to several weeks, as may be the case with lead. The rapidity of absorption depends on many conditions. A few of the more important of these from the dentist's point of view will be discussed briefly. Absorption and the rapidity of drug action are often greatly influenced by solubility. In fact, a drug must be soluble in order to be absorbed. Moreover, drugs that are entirely insoluble cannot be absorbed and therefore their ingestion can have no therapeutic effect. Their action, if any, must of necessity be purely mechanical. But solubility of drugs in the body fluids, which must occur before absorption can take place, cannot be compared to their solubility in water or in some other simple solvent in a test tube. Owing to their very nature and functions, the digestive fluids, with their changing pH values, enzyme action and other peculiar characteristics, will, in many cases, bring about partial or complete solution of drugs that are practically insoluble in the test tube. If two drugs which possess similar therapeutic properties, but which differ materially in their solubilities, are administered together, the one that is less soluble will, in all probability, take effect more slowly than the more soluble one. The effect of the former, although slower, is usually more lasting owing to less rapid absorption and elimination. For example, the effects of a dose of barbital, owing to its lower solubility, would be slower, but more lasting than the effects of a dose of soluble barbital, which would have a more rapid effect, but one of shorter duration because of its greater solubility.

The time of administration will, in many cases, also affect the rapidity of absorption. Drugs taken into an empty stomach will be absorbed more rapidly than when given during or shortly after a meal.

The solvent powers of the gastric and intestinal juices are so great that few medicinal substances remain undissolved in them. Usually, a substance in solution or a readily soluble substance is more rapidly absorbed from the stomach than one that is less soluble. Moreover, it may happen that a substance in solution is precipitated by the gastric juices, as, for example, some of the soluble salts of

iron, and this will naturally retard the rate of absorption of such a material. Medicines that have a locally irritant action are best given when the stomach is full so that they may be diffused through the mass of food and not come in contact in concentrated form with the mucous membrane. When medication of the mucous membrane of the intestines is desired, it is better to give the medicine at a time when there is a natural flow of partially digested food from the stomach into the intestine. Such remedies are best administered from one to two hours after a meal.

VII. TIME AND METHOD OF ADMINISTRATION OF DRUGS

A knowledge of the time and method of administration of remedies is of importance because, from it, we can gain information as to the rate at which these remedies are absorbed and the influence which they exert upon tissues with which they come in contact during their entrance into the body. The portals of admission of medicines to the human body are the stomach, by way of the mouth; the rectum; the lungs; the skin, the cellular tissues beneath the skin, and the blood stream. Obviously, under ordinary conditions, the most general method of administration of medicines by the dentist is by mouth or, if conditions exist that make it advisable, by hypodermic injection. It is seldom that the dentist is called upon to administer medicines by way of the rectum or lungs. It should be remembered that the function of the rectum is to throw off rather than absorb and that, therefore, its juices have feeble solvent powers. Medicines are, as a consequence, absorbed by the rectum slowly, and therefore, when rapidity of effect is desired, this method of administration should not be used. It is estimated that approximately twice the time is required for absorption from the rectum as from the stomach and, as a rule, the rectal dose of a medicine is about one-half greater than the dose by mouth.

In contrast to the slowness of absorption from the rectum, the rapidity of absorption of medicines when administered by hypodermic injection should be noted. Whereas drugs are absorbed about one-half as fast from the rectum as from the stomach, those administered hypodermically are absorbed in about one-half the time required for absorption from the stomach, and usually the hypodermic dose may be estimated as about one-fourth less than the stomach dose. This difference arises partly from more rapid absorption and partly from the fact that the drug, when administered by mouth, may be altered or destroyed to some extent by the digestive fluids.

There are many objections to hypodermic medication, one of these being the danger of throwing the entire dose into the blood vessel at once. Moreover, abscesses and ulcerations may result if the syringe, the solution or the site of injection is not aseptic. Because tissue fluids are alkaline in reaction, drugs that are insoluble in alkaline solutions or those having a strong locally irritant action should not be administered hypodermically, and the danger of administering such a drug in error is one of the objections to administration of drugs by this method. The hypodermic method for administering medicines should be used by the dentist only when oral administration is impractical or when he is absolutely sure of his method of administration and the nature of the drug.

Drugs administered by inhalation are generally employed with the object of affecting the respiratory tract alone. Notable exceptions are, of course, those general anesthetics administered by inhalation. Obviously, only volatile drugs, gases, vapors and fine sprays can be used for medication by inhalation.

VIII. ELECTIVE AFFINITY OF DRUGS

Most drugs have an elective affinity for certain definite tissues. Some drugs act on the central nervous system, others on the terminal nerves in muscle and others on the heart. Among those that act on the heart, some affect the ventricle, others the auricle. No drug is known to act equally on all organs and tissues. Those that seem to have the widest field of action are the protoplasmic poisons. These affect any form of living matter when brought in contact with them in sufficient quantity, but if they are injected into the blood stream, and thus distributed equally throughout the body, they usually show an elective affinity and select some special organ as the chief seat of their activity. This action approximates the behavior of certain chemical agents in the laboratory. Thus, it will be seen that a drug applied locally may act differently from one administered internally or injected into the blood. In the one case, the action is general, affecting alike all of the tissues with which it comes in contact; while, in the other case, the action is more specific and elective.

IX. SYNERGISTIC ACTION OF DRUGS

When one drug reinforces the action of another drug, they are said to be synergistic. When two such drugs that have similar therapeutic effects in the body are given together, the action of the mixture is often increased to an unexpected extent over that of each of the constituent drugs. Such behavior of certain drugs when given together is justification for the prescription of several remedies acting in the same way. For example, several carthartics given together often act more effectively than any one of them given in a quantity equal to all of them. Furthermore, in the case of analgesics, such as acetophenetidin, aminopyrine or acetylsalicylic acid, which are frequently prescribed by the dentist for postoperative and other pain, two of these may act more effectively than one. It is stated that some of the barbituric acid compounds, such as barbital, barbital soluble, phenobarbital and phenobarbital soluble augment the action of the above-mentioned analgesic drugs. Such synergistic action is explainable on the assumption that although all are alike in their chief features, they differ in the details of their reactions. Thus, parts of the alimentary canal which might escape the effect of one are affected by another, and the mixture may have a more complete and desirable action than if one of the drugs were administered by itself. The importance of synergism is often exaggerated, but, in some cases, the increased activity of one drug in the presence of another is remarkable. Synergism should not be confused with empiricism in polypharmacy, for which there is never any justification. On the other hand, a drug may fail to produce desired symptoms if an antagonistic substance is present in the body. Thus, when a general anesthetic, such as chloroform or ether, which has a depressing effect has been inhaled, administration of stimulants, such as strychnine, in normal doses, will not have the therapeutic results expected.

Similar modifications of the effects of drugs may be induced by poisons formed by pathologic changes in the tissues or by an unusual state of irritation or depression of the tissues themselves. In fact, if an antagonistic poison is formed in the tissues during the course of a disease, a drug will have little or no effect.

X. INFLUENCE OF PREVIOUS OR CHRONIC AILMENTS ON DRUG ACTION

Previous or chronic ailments, as well as impairments resulting from past ailments, may modify the action of certain drugs, and may even make it dangerous to give certain drugs or may necessitate a great reduction in dosage. On the

other hand, such conditions may hinder the good effects of drugs and necessitate an increase of the dose. Affections of the kidneys modify the general effects of drugs by diminishing excretion, and by increasing the sensitiveness of the organ to an irritant. Care is therefore necessary, where such conditions exist, in the administration of toxic drugs which are ordinarily eliminated by way of the urine. Potassium salts, which normally can be given as freely as the corresponding sodium compounds because they are excreted as fast as they are absorbed, may become dangerous if elimination is delayed. Salicylic compounds given in doses that may be harmless to persons with healthy kidneys may cause distressing symptoms in subjects with chronic nephritis. The synthetic hypnotics are peculiarly dangerous in persons with impaired renal function, and therefore salicylic compounds, either alone or in combination with synthetic hypnotics, which are frequently prescribed by dentists for postoperative and other pain, should be carefully avoided in such cases. In arteriosclerosis, drugs that would increase tension or cause dilatation of the blood vessels should, if given at all, be administered with great caution.

XI. HYPERSENSITIVENESS TO OR INTOLERANCE OF CERTAIN DRUGS

Some individuals cannot take a drug in average doses or show a tendency to some particular effect. It may be original (idiosyncratic) or it may be acquired. Idiosyncratic intolerance is manifested by a relatively small number of persons; while the intolerance that develops during medication is common. In either case, the reaction may be so great, so unpleasant or so dangerous as to forbid the use of the drug by the person showing it. Allergy or intolerance, as used in medicine, is a general term for all conditions of abnormal or altered tissue sensitivity to (1) agents which normally cause a limited or standard reaction, such as drugs or bacteria, and (2) agents that are ordinarily innocuous, such as foods or pollens. The symptoms and signs of conditions due to drug sensitization are manifested in the epidermis in the form of an eruption and in the rest of the body as angioneurotic edema. Reactions due to hypersensitivity may develop from either internal or external use of the drug. However, the fixed drug eruption, as far as it is known, appears, except in the case of antipyrine, only as a result of the internal use of the particular drug. The tissues suffering shock in drug eruption are located primarily in the skin.

Oral manifestations of allergy are usually hives or canker sores. There are a number of drugs to which peculiar, individual sensitiveness is not uncommon, necessitating constant care and watchfulness in their use. Acetyl salicylic acid is notable for such severe reactions as asthma, coryza, urticaria, angioneurotic edema and gastrointestinal disturbances. Even death has followed its administration. There have been similar results from the use of cocaine and some of the synthetic local anesthetics, such as procaine. Skin lesions of various types which do not always confine themselves to the structures within the oral cavity have appeared. Moreover, they may persist for a long time after discontinuance of the offending substance. In addition to acetyl salicylic acid and procaine, allergic reactions have followed the administration of the following drugs: bromides, iodides, quinine, salicylates, opium, strychnine, caffeine, arsenic, mercurials, bismuth, sulfone hypnotics, barbiturates and phenolphthalein. Moreover, ingestion of other products, such as vitamins, glandular substances, calcium, ergosterol and cod-liver oil, may have similar allergic reactions, and the frequency with which some of these drugs are used in

dental medicine suggests that dentists use constant vigilance when prescribing them. Gouty persons, especially those prone to eczematous outbreaks, frequently exhibit undue sensitiveness to drugs in general. Of course, with numerous drugs, intolerance is exceptional; yet it should always be kept in mind that it is possible with any.

XII. DRUG TOLERANCE

Drug tolerance is marked by an uncommon or extraordinary degree of resistance to the influence of medicaments and poisons in general or to that of particular agents. It may be manifested with regard to the entire sphere of action of a drug or with regard to special phases only. It is exhibited in two forms, which may be termed respectively original and acquired.

Original tolerance is a phenomenon somewhat akin to a natural immunity, racial or individual, to infectious maladies. It is rarely absolute, and not only do individuals possess it in different relative degrees, but its intensity may vary in the same individual under different conditions. It is an idiosyncratic resistance, as contrasted with an idiosyncratic susceptibility. Original tolerance commonly influences therapeutic intervention only as it requires a particular drug to be given in a larger dose than ordinary. In less frequent instances, it may necessitate either supplementation by means of another drug or drugs or the substitution of a different agent or method.

Acquired tolerance to drugs may be developed by any one, but by some in much greater degree than by others, and for longer periods. It is more easily induced in the case of certain agents such as opium, coca, tobacco and alcohol. For the great mass of drugs, tolerance either does not occur at all or is limited and transient. With certain agents, such as mercury, iodides, arsenic and lead, an apparent tolerance may evolve suddenly or gradually into evident chronic poisoning.

To say that acquired tolerance results from custom or habit and that it is induced by the use of small doses, gradually increased to large ones, describes its production, but does not explain its character. In the case of certain toxalbumins derived from plants, antibodies are formed, as in acquired immunity to microbic poisons.

With regard to certain drugs, the mechanism of tolerance has been in part established. Increased destruction is probably the common way with alkaloids. It has been shown, for instance, that subjects showing morphine tolerance or habit oxidize the poison (or destroy it in some other manner not known) much more rapidly than do normal persons, and a smaller quantity thus reaches the central nerve system.

Abnormal tolerance to arsenic is shown only when the drug is taken by mouth and, in view of the local changes induced by the irritant action of the poison in the alimentary canal, such tolerance is thought to be dependent largely on failure of absorption. Medicinal tolerance, however, may be induced to a limited extent by subcutaneous and intramuscular injections. Hence, both with agents of this type and with habit-forming alkaloids, there must develop an actual resistance of the tissue cells to larger quantities of the drug than the same cells are normally subjected to.

There may possibly, in some instances, be an alteration of cell walls, to which crude analogies are offered by the epidermic thickening that results from continued friction or pressure, such as a superficial coagulation produced by alum and similar agents acting topically, and the thickening of the bacterial cell walls brought about by arsenic.

There is also a condition known as crossed tolerance; that is to say, toler-

ance for one drug acquired through habituation to another. Thus, alcoholics are notably difficult to anesthetize with other diffusible narcotics. Moreover, the use of one opium alkaloid may induce heightened resistance to others.

Finally, it is to be observed that tolerance differs from the exhaustion of overstimulation which results at times from the long continued use even in moderate doses of certain agents. The tissues in such cases fail to respond because they have lost their ability to do so. This condition is especially marked with saline carthartics, which indirectly bring about a relaxation of the muscular tissues of the intestines and a soggy, inelastic, atonic state of the mucous membrane, and is also sometimes observed during the administration of digitalis.

Tolerance, of course, must not be confused with immunity.

XIII. DRUG ADDICTION

Drug habit or addiction is acquired tolerance and something more. It is a morbid craving that results from the habitual use or abuse of certain drugs, chiefly stimulants, narcotics, analgesics and hypnotics. Among the chief habit-forming drugs at the present time are opium and its derivatives, cocaine, alcohol, tobacco, caffeine, cannabis, the sulfone hypnotics, the barbiturates, acetphenetidin, acetanilid and acetyl salicylic acid. A high degree of tolerance may be acquired by the addict, which makes it necessary to give large doses of the drug to which he is addicted in order to assure a therapeutic effect or satisfy the craving for sedation. These large doses exert further deleterious influences upon the various tissues and functions. Thus, a vicious circle is started or continued. The condition becomes not merely one of tolerance to the drug, but of tolerance existing side by side with chronic intoxication.

This paper has been prepared primarily for the practicing dentist in order that he may be reminded of the conditions which he may meet in his daily practice and which may have a modifying influence upon the action of the drugs that he employs. Instead of using fixed doses of medicines of a proprietary nature, the dentist should meet the unusual conditions by availing himself more often of his privilege of writing prescriptions. Writing prescriptions for the treatment of the diseases of the soft tissues of the oral cavity, instead of dispensing, or advising the patient to buy, some patent or proprietary medicine places the dentist on a higher professional plane in the estimation of his patients. Furthermore, in many cases, he will meet the need of the patient more nearly.

It is to the dentist who can write prescriptions and who sees the desirability of doing so that I have addressed myself.

Marquette University.

A CEPHALOMETRIC STUDY OF THE MOVEMENTS OF THE MANDIBLE

By JOHN R. THOMPSON, D.D.S., M.S., M.S.D., Chicago, Ill.

IF one stops to analyze the present-day concept of mandibular movements, he finds that they are almost wholly of a mechanical nature. If we list those structures that are involved, namely bone, ligaments, cartilage, muscle and nerves, we would certainly have to call the first three inert. These parts that are acted upon can be considered from a purely mechanical point of view. The other two tissues are quite a different matter and are altogether too poorly understood by even the physiologist. While a muscle may be looked on as a force-producing engine, in the manner of its working it resembles no machine with which man is familiar. As a result of lack of knowledge of muscle tissue, several misconceptions have arisen and several obvious phenomena have been overlooked.

Our studies of dead material in the anatomic laboratory have led us to think of muscles as they are portrayed in the cadaver and in textbooks; namely, as contractile strings or ropes having axes of action that are represented by the mean of all of the fibers comprising them. We tend to think of a muscle as a single organ. Common observation should tell us that this idea is false. In watching a horse get rid of flies by rippling his skin, one realizes that one part of a muscle may contract without another.

Read before the Section on Orthodontia at the Eighty-Second Annual Meeting of the American Dental Association, Cleveland, Ohio, September 10, 1940.

From the Graduate Department of Orthodontia, University of Illinois.

The temporal muscle in man has been shown to be composed of at least five heads, and the study of the muscles in lower animals frequently points to the fact that a single muscle has been derived from a number of precursors, each maintaining at least part of its former individuality. The masseter of the dog has four heads and that of the rat an equal number, but arranged in an entirely different manner.

A muscle is made up of individual muscle fibers, each actually a muscle in itself. Sherrington,[1] English physiologist, formulated the "all or none" law of the muscle fiber. He demonstrated that the fiber can only be in a state of absolute relaxation or at maximum contraction. When it contracts, it does so to its fullest extent. Whether the muscle contracts "a little or a lot" then is quantitative, depending on the number of individual muscle fibers involved; the latter being dependent on the degree of nervous stimulation conveyed to the muscle. The normal resting muscle is always in a state of partial contraction, known as tonus. The maintenance of this condition is the responsibility of a few fibers, contracted to their fullest extent for short periods of time. When one group relinquishes this work, another takes it up.

A point that is too frequently overlooked is that no muscle groups exist which do not have some form of antagonism. This may arise from another group of muscles, it may be due to gravity or it may be a combination of the two. But whichever it may be, the two antagonizing forces are always exactly balanced at rest.

We have come to think of a muscle in a position of rest as at its greatest length; whereas a moment's reflection should tell us that if one muscle shortens in function, its antagonist must lengthen. Extensibility is a property of muscle tissue. The muscles in our bodies are stretched between origin and insertion, and if a muscle is severed, both of the cut ends contract. Therefore, in our joints, the arrangement of the flexors and extensors is such that contraction of one will move the bone against the elastic tension of the antagonists. Sherrington[2] explained how this interaction was possible by his demonstration of reciprocal innervation and reciprocal inhibition, showing that the nervous stimulation that causes a group of muscles to contract also conveys to the antagonistic group an inhibitory reflex that permits this group to lengthen. The muscles that become lengthened do not completely relax and the remaining tension imparts smoothness to the movements. Let us imagine a maypole with its colorful ribbons replaced with elastic strings. As the group of children on one side pull on their strings, the pole will lean toward them and the strings being held by the group on the opposite side will exert a restraining force as the strings lengthen. So it is with the muscles acting on a joint. The movement is under control at all times by the coordinating action of the extensors and flexors.

Another place where we have fallen into error is best indicated by the constantly recurring words in our anatomy texts "The function of this muscle is to——," etc. Actually, there are probably very few muscles in the body that have only the one pure function that such a description indicates. Muscles that are now used for certain functions have frequently been devoted to quite different functions in the past. Likewise, as new functions have arisen, they have frequently been served by parts already in existence, and the part takes on a pattern that serves the new function without any loss of efficiency of the old. One of the best places to study this type of

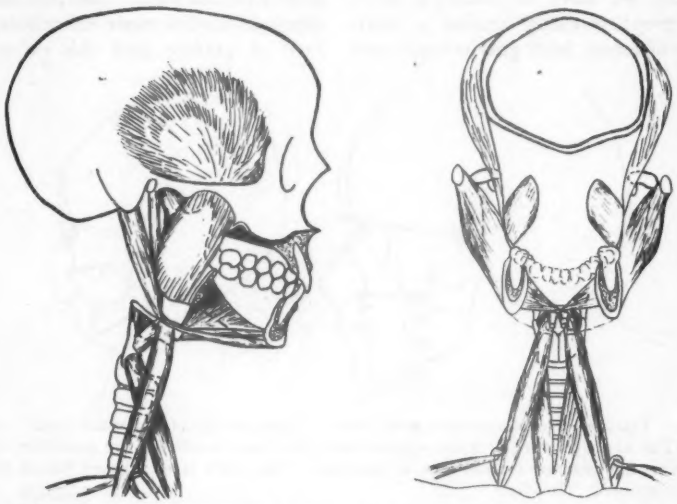

Fig. 1.—Diagrammatic representation of masticatory and suprahyoid and infrahyoid groups of muscles that, acting as unit, are antagonistic to powerful postcervical group in maintenance of head posture. (Brodie.)

accommodation is the musculature of the back. The antagonistic action of exactly balanced groups is readily seen in the bilateral symmetry of the muscles. Anteroposterior equilibrium is not so easily detected. However, it is present and can be demonstrated in many ways.

The vertebral column may be considered as a series of spools set one upon another. On top of this flexible column is the head. All are joined together by ligaments, but our erect position is maintained by the coordinating action of the muscles surrounding the column. In such a posture, we have an example of a muscle group working against a combination of forces, both gravitational and muscular. The proportion between them varies with the species. In the anthropoid posture, gravity exerts a stronger influence than it does in man. The occipital condyles face posteriorly and, because of this, there is a proportionately greater development of the postcervical muscles. Steindler[3] has pointed out that the erect posture of man has required a special development of the extensor muscles of trunk, hips, knees and ankles. Since the viscera are all hung from the vertebral column and anterior to it, gravity must be overcome by the musculature of the back. If this checkrein becomes inoperative, as in fainting, we fall forward.

Brodie[4, 5] has recently applied these same principles to the head and neck region in an effort to explain several heretofore obscure points. Briefly, his reasoning is as follows:

The axis of gravity passes through the head quite close to the occipital condyles; which imparts a certain equilibrium to the head. However, there is more weight anteriorly to the axis than posteriorly, as demonstrated by the fact that if we fall asleep sitting erect, the head falls forward. The powerful postcervical muscles more than balance this load of gravity, and this excess power must be counteracted by other forces or the head will be carried backward.

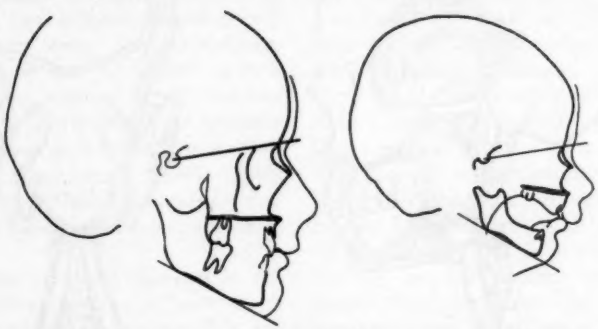

Fig. 2.—Tracings of cephalometric x-ray films of child at age of 3 months (right) and age of 7 years. The angle formed by a line representing the lower border of the mandible with a line representing the anterior cranial base is constant. This angle is established before any of the teeth have erupted. (Brodie.)

A continuous sheath of muscles from cranium to thorax would balance the posterior muscles, but would not permit mastication, deglutition or respiration. Each of these functions call for the movement of different parts and, as a result, the anterior muscular arrangement is in the form of a chain, each link of which is capable of independent, but coordinated action. The chain as a unit counteracts the excess pull of the posterior group and maintains the posture of the head.

The chain is composed of three major links: the muscles of mastication connecting the mandible with the cranium; the suprahyoids, suspending the hyoid bone and larynx from the chin point and base of the cranium, and the infrahyoids, connecting the hyoid bone and thorax. (Fig. 1.) The spatial relationship of the parts is maintained by the tension of these muscular groups. Thus, the position of the mandible at rest is determined, not by the teeth but by the musculature running to it from above and below, the same as the hyoid bone.

Brodie,[6] utilizing the Broadbent-Bolton cephalometer, has shown that the angle

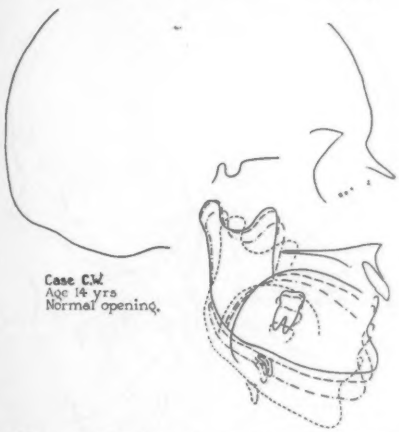

Fig. 3.—Tracing of cephalometric x-ray films with mandible in four positions. The corresponding positions of the tongue and hyoid bone are also shown. Solid line, occluded; dashes, first opening; dash-dot, second opening; dotted line, wide opening.

formed by a line representing the anterior cranial base with a line representing the lower border of the mandible tends to remain constant. (Fig. 2.) This angle is established before any of the teeth have erupted. Another constant angle is that formed by the same cranial base and the plane of occlusion. The remarkable constancy of these angles confirmed his opinion that the mandible is suspended in a position of physiologic rest between the hyoid bone and the skull by an equilibrium of muscular tension above it and below it.

Recalling our previous point that as one group of muscles contracts, its antagonists must relax, we can readily see that as the hyoid bone is raised by the suprahyoid muscles in deglutition, not only must the infrahyoid relax, but also additional tension must be developed in the masticating group to prevent the mandible from being pulled down. Similarly, there is a highly complicated reflex chain necessary to maintain the

Fig. 4.—Normal opening.

position of the hyoid bone during mastication. And with all of this activity within the anterior group, the chain, as a unit, must maintain the tension necessary to counteract the pull of the postcervical groups for posture.

Another important factor that must be considered in a discussion of muscles is their behavior patterns. Voluntary muscles must be educated, but all groups do not require the same degree of education. There is a wide variation between individuals as to the ability of their neuromuscular mechanisms to learn.

This is the difference between the "dub" and the expert. The most difficult problem of the golf instructor is to undo the bad habits or incorrect behavior patterns of the muscles involved in the swing.

The child having malocclusion with a deep overbite masticates with a more or less "open and shut" path of movement of the mandible. The normal lateral movement is restricted by the deep overbite. This abnormal path of mastication becomes deeply ingrained and the muscular behavior pattern has been conditioned by the malocclusion. When the malocclusion has been corrected and lateral mastication becomes a possibility, instruction in the correct method must be given. This will at first be difficult for the patient, but the more it is practiced, the more deeply ingrained becomes the normal behavior pattern of the muscles, with a consequent saving of energy.

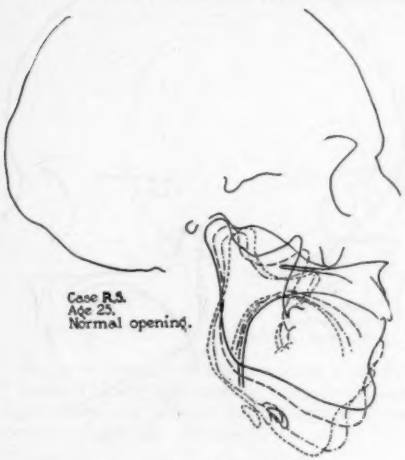

Fig. 5.—Normal opening.

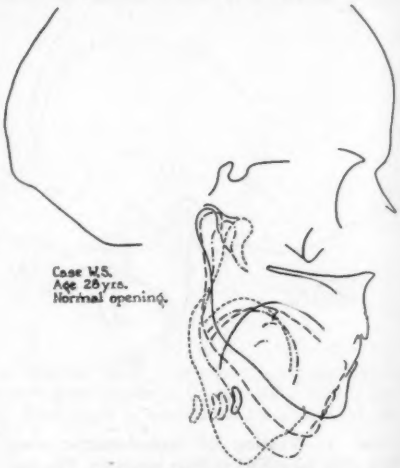

Fig. 6.—Normal opening.

Since this study is devoted to consideration of the movements of the mandible, we shall restrict ourselves as far as possible to this phase of activity, but we must keep in mind the influence of the factors enumerated above.

Considerable controversy still exists over the temporomandibular articulation, the movements of the mandible and the muscles that bring about the various movements. Higley[7] has adequately summarized the various controversial views on these subjects in a recent publication.

It is well-established that the head of the condyle moves forward to occupy a position below the eminentia articularis during the opening excursion of the mandible. However, there is a difference of opinion as to the muscles that account for this movement. The controversy as to whether the suprahyoid muscles or the external pterygoid muscles are the responsible agents in depressing the mandible has long existed. Chissin,[8] in 1906, as a result of his study of fresh cadaver material, concluded that the upper head of the external pterygoid was the muscle that depressed the mandible in opening the mouth. He pointed out that contraction of the suprahyoid muscles would depress the mandible, but that an abnormal opening would occur since the head of the condyle would remain in the fossa.

Lord[9] mechanically reconstructed the joint and demonstrated that the individual action of the superior head of the

external pterygoid would be fully capable of opening the jaw in a manner similar to that movement in the human being. His teacher, Prentiss,[10] had already assumed this and had named this head the sphenomeniscus muscle.

On the other side of the question are ranged most of our textbooks, which maintain that the suprahyoid muscles are largely responsible for the opening movement. This opinion is based on the apparent position of mechanical advantage of these muscles as observed on the cadaver. Furthermore, the anatomy texts state that for the suprahyoid muscles to depress the mandible, the hyoid bone must be fixed by contraction of the infrahyoid muscles.

Sicher[11] studied man's nearest relative, the chimpanzee, and observed that the head of the condyle does not leave the fossa as the mandible is depressed; hence, he concluded that the combined rotating-sliding movements of the mandible in opening are characteristic of man alone. Sicher points to the fact that the bending downward of the base of the skull and the development of the mastoid process, along with the change to an erect posture, have narrowed the space behind the temporomandibular joint. He concluded that compression of the tissues in this retromandibular space resulted in the establishment of a fulcrum in the ramus with the consequent forward movement of the condyle.

Regardless of opinion, there are certain points that are self-evident. We know that in opening the mouth, the condyle does move forward. This could only occur under conditions which would reveal contraction of the external pterygoid and relaxation of the masseter, internal pterygoid and temporal muscles. All of these are muscles of mastication and all are served by the same nerve. Here, we have a demonstration of Sherrington's principle of reciprocal innervation and reciprocal inhibition within a single group of muscles.

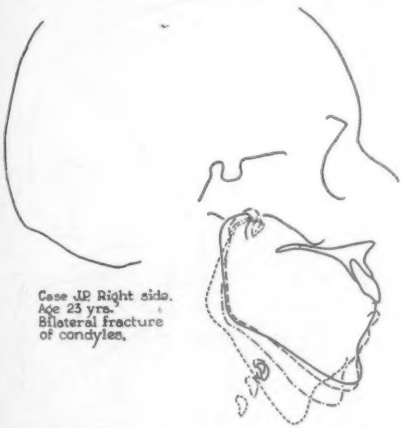

Fig. 7.—Bilateral fracture of condyles (right side).

Fig. 8.—Bilateral fracture of condyles (left side).

Inhibition of the antagonists is simultaneous with excitation of the external pterygoid muscles. This inhibition is necessary, as otherwise contraction of the external pterygoid muscles will be reflected as protrusion. In protrusion, the lower head of the external pterygoid muscles is predominant. We must remember that the upper and lower heads of the external pterygoid muscles can contract independently of each other.

As the mandible is depressed and drops

in mastication, the suprahyoid musculature must take up the slack in the chain so that the hyoid bone and larynx will not be displaced too far downward and backward. As the mandible is raised, the suprahyoid muscles must lengthen, as otherwise the head would be tilted forward since the anterior muscular chain would be exerting more tension than the posterior group.

The Broadbent-Bolton cephalometer offers an excellent means of studying some of these controversial points and permits an accuracy of approach not attained by any other means. Not only is it possible to identify the hard parts involved, but also the tongue, soft palate and hyoid bone are clearly revealed. The files of the Department of Orthodontia of the University of Illinois, containing the records of nearly ten years, yielded a number of abnormal cases that represented almost every condition that could have been experimentally produced. This report will deal with certain of these abnormal cases.

Fig. 9.—Bilateral resection of condyles.

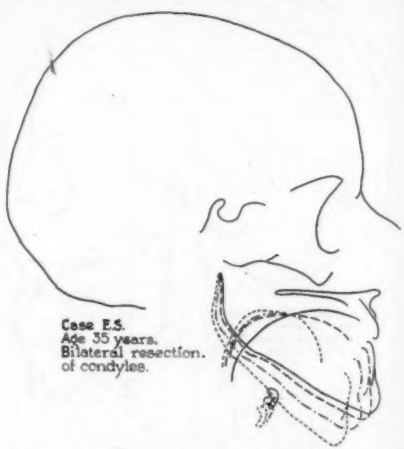

Fig. 10.—Bilateral section of condyles. The condyles are present, but were not included in the tracings. They have been pulled forward by the external pterygoids.

NORMAL OPENING CASES

C. W., aged 16 years (Fig. 3), presented a case the significant features of which were as follows: 1. The head of the condyle moved only slightly forward at an opening of 5 mm. It then moved downward and forward to occupy a position below the eminentia articularis at the wide opening of 33 mm. The point of rotation for the opening was at first in the head of the condyle (hinge action occurring between the head of the condyle and the meniscus) and it then moved progressively downward. It appeared to be the same for the third and fourth positions. 2. The chin point moved downward and backward. 3. The tongue rotated with the fulcrum in the region of the insertion of the styloglossus muscle. 4. The hyoid bone moved progressively downward and backward, but it maintained a level higher than that of the chin point. Thus, the suprahyoid musculature was not in a position of mechanical advantage to efficiently depress the mandible.

M. S., aged 11 years (Fig. 4), presented the following conditions: 1. The head of the condyle moved only slightly forward at an opening of 4 mm. It then moved downward and forward to occupy a position beneath the eminentia articularis. 2. The chin point moved downward and backward. 3. The tongue rotated at the fulcrum located at the insertion of the styloglossus muscle. 4. The hyoid bone moved only slightly downward

and backward, maintaining a level above that of the chin point.

R. S., aged 25 years (Fig. 5), presented the following: 1. The condyle moved downward and forward until it occupied a position beneath the eminentia articularis at an opening of 28 mm. For the opening of 35 mm., the condyle moved upward and forward to a position anterior to the eminentia articularis. The patient had a wide range of mandibular movement. 2. The chin point moved downward and, in the widest opening, it moved almost directly backward. 3. The tongue rotated at the fulcrum established by the styloglossus muscle. 4. The hyoid bone moved backward and only slightly downward. It assumed a position at

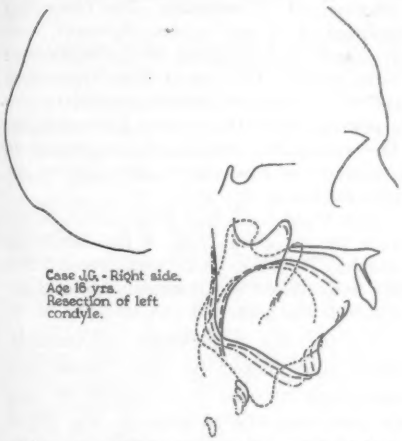

Fig. 11.—Resection of left condyle (right side).

a level above that of the chin point during depression of the mandible.

W. S., aged 29 years (Fig. 6), presented the following: 1. The condyle moved downward and forward to occupy a position beneath the eminentia articularis. It then moved forward and upward to a position anterior to the eminentia at an opening of 48.5 mm. 2. The chin point moved downward and backward and, in the wide opening, it moved almost directly backward, with very little downward movement. 3. The tongue rotated at a fulcrum established by the styloglossus muscle. 4. The hyoid bone followed a steady downward and backward path. In this case, the level of the hyoid bone and the level of the chin point are to be noted. The suprahyoid musculature was not in a position of mechanical advantage to depress the mandible.

SUMMARY OF NORMAL OPENING CASES

A number of features are common to all four of the normal cases:

1. The head of the condyle moved downward and forward to a position beneath the eminentia articularis. On very wide opening (R. S., Fig. 5; W. S., Fig. 6), the condyle moved upward and forward to a position anterior to the eminentia. The contraction of the superior head of the external pterygoid was

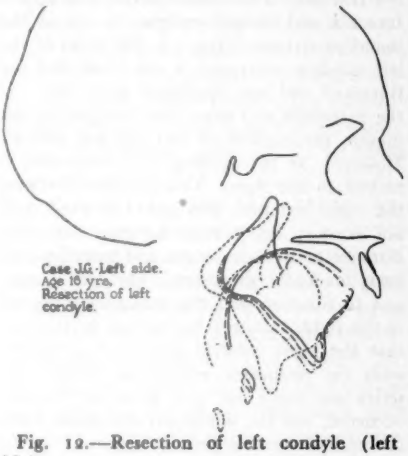

Fig. 12.—Resection of left condyle (left side).

alone responsible for this movement.

2. The point of anterior attachment of the suprahyoid muscles that support the tongue, hyoid bone and larynx, viz., the symphysis of the mandible, moved downward and backward. These muscles must contract in order to maintain the position of these structures. However, the distance between the hyoid bone and the symphysis was not markedly decreased.

3. The tongue rotated downward and backward on a fulcrum established by the insertion of the styloglossus muscle.

4. The hyoid bone followed a fairly

constant downward and backward path. At rest, the hyoid bone was at a level slightly below that of the symphysis or chin point. When the mandible was depressed, the hyoid bone maintained a level well above that of the symphysis. The suprahyoid musculature then was no longer in a position of mechanical advantage to depress the mandible.

ABNORMAL OPENING CASES

J. P., aged 23 years, presented a fracture of the condyles (right side, Fig. 7; left side, Fig. 8).

Reduction of the condyles to their correct positions did not occur during treatment of the fracture. The right condyle was pulled forward and inward completely out of the mandibular fossa. (Fig. 7.) The head of the left condyle remained in the fossa, but the fractured end was displaced anteriorly. As the mandible was depressed on opening the mouth, the midline at first did not deviate. However, as the opening was continued, it moved to the right. This occurred because the right external pterygoid muscle could not exert its full normal influence since the distance between its origin and insertion had been markedly shortened. The left continued to function and the mandible deviated to the right. Another factor may be the fact that the right condyle could not articulate with the eminentia articularis. This x-ray series was made one year after the fracture occurred, and the significant deviations from the normal opening should be noted.

1. The right condyle (Fig. 7) moved downward and forward only a slight distance. The stability of the condyle in the third and fourth positions indicated that the depressing movement of the mandible was now a pure hinge action. The suprahyoid musculature must be responsible for this movement.

2. The path of the hyoid bone was altered in that there was a more direct dropping of the bone. This occurred so as to place the suprahyoid musculature in a position of mechanical advantage to depress the mandible. The distance of the hyoid bone from the symphysis was markedly decreased on wide opening.

3. The left condyle (Fig. 8) moved downward and forward until it occupied a position beneath the eminentia articularis.

W. U., aged 19 years, presented a bilateral resection of the condyles. (Fig. 9.) A bilateral ankylosis of the temporomandibular joints was present at the age of 11 and resection was performed a few months later. This series of x-ray films were made seven years after the operation. Two marked deviations from the normal opening are evident.

The depression of the mandible was a pure hinge action with the fulcrum located in the neck of the condyle at the point of resection. The movement that occurred from the occluded position to the opening of 4 mm. was probably the result of gravity, as the internal pterygoid, masseter and temporal muscles are inhibited. The hyoid bone maintained a position above the level of the symphysis of the mandible. The succeeding positions of 17 and 23 mm., however, were the result of contraction of the suprahyoid musculature. The hyoid bone had been pulled downward a considerable distance to a position below the level of the symphysis. This placed the suprahyoid musculature in a position of mechanical advantage to depress the mandible.

The hyoid bone had been pulled downward by the contraction of the infrahyoid muscles. Palpation of the neck revealed that this musculature was extremely tense as the mandible was depressed.

To try this experiment on yourself, place your fingers on your throat and open your mouth: You will not be able to feel any contraction of the hyoid musculature. Now repeat the procedure and, at the same time, concentrate on keeping the condyle heads back in their mandibular fossae. You will feel the hyoid musculature contract, and it is now functioning to depress the mandible.

E. S., aged 33 years, presented a bilateral resection of the condyles. (Fig. 10.) The necks of the condyles were sectioned in this case three months previous to the making of this series of x-ray films. Movement of the mandible was limited to depression and elevation. No lateral movement was possible. The mouth could be opened only 19 mm. The x-ray series revealed that the mandible was depressed by a hinge action only, the point of rotation being located in the region of the condyles.

Since the mandible was depressed by a hinge action and the condyles did not move downward and forward, it was evident that the external pterygoid muscles were not functioning. The only other forces that can cause depression are gravity and the hyoid musculature. The path of movement of the hyoid bone is no different from the normal; therefore, gravity must be the activating influence. The opening of 19 mm. could be attained only with much effort. This effort indicated that the muscles of mastication and the hyoid muscles were fighting each other. Two forces were probably responsible: First, the hyoid musculature had not learned this new function of opening the mouth, and, second, the nerves of the infrahyoid, suprahyoid and masticatory groups had not yet been coordinated through the central nervous system.

It seems safe to predict that as the patient develops a wider range of opening with greater ease, the path of movement of the hyoid bone will be altered so that the geniohyoid, digastric and mylohyoid muscles will be placed in positions of mechanical advantage to depress the mandible. The hyoid musculature will gradually learn this new function.

J. G., aged 16 years, presented a resection of the left condyle. (Fig. 11, right side; Fig. 12, left side.) At 2½ years, the left condyle became ankylosed and it remained so for eleven years. The resection was performed when the patient was 13 years old. Three and a half years elapsed before this x-ray series was made. On the normal side (Fig. 11), the condyle moved forward and downward to a position beneath the eminentia articularis. On the abnormal side (Fig. 12), movement was restricted to a pure hinge action as the external pterygoid could not function. Since the right condyle moved forward and the left side did not, the midline necessarily deviated to the resected side on opening. This deviation began immediately the mouth was opened.

The position and path of movement of the hyoid bone was such that it was always at a lower level than the symphysis. This indicated that the hyoid musculature had been trained to assist the right external pterygoid in depressing the mandible. Palpation of the neck during the opening movement also revealed that the suprahyoid and infrahyoid muscles were contracting to depress the mandible.

SUMMARY OF ABNORMAL OPENING CASES

An analysis of the cases presented suggests that the suprahyoid muscles do not normally assist in depression of the mandible. These muscles contract as the mouth is opened and the symphysis goes downward and backward. They do this in order to maintain the position of the hyoid bone and the larynx. If the external pterygoid muscles can no longer function, as in the case of resection of the condyles, the hyoid musculature can adapt itself to depress the mandible. It requires time for these muscles to acquire efficiency in performing this new function. The hyoid musculature in case E. S. (Fig. 9) had not yet learned this new function; consequently, the amount of opening was limited and it was only accomplished with great effort. In those cases of resection (J. P., Fig. 7; W. U., Fig. 8, and J. G., Fig. 11) wherein considerable time had elapsed, the hyoid musculature had been coordinated and adapted to depress the mandible. In all of these cases, the hyoid bone dropped to a point below the level of the symphysis of the mandible. This placed the suprahyoid muscles in such a position that they could more effectively pull downward and backward on the symphysis.

When the suprahyoid musculature is the mechanism that depresses the mandible, the opening movement is a pure hinge action with the fulcrum located in the region of the condyle or at the resection.

CONCLUSIONS

The significant facts concerning muscle physiology and the position and movements of the mandible in particular are these:

1. A muscle is composed of many individual muscle fibers reacting to a stimulus by contracting to their fullest extent.

The amount of contraction of the muscle as a whole is dependent on the number of individual fibers involved.

2. A muscle does not necessarily act simultaneously as a unit. The upper and lower heads of the external pterygoid muscles can and do contract independently of each other. In all probability, the upper head functions in opening the mouth and the lower head functions in the lateral and protrusive movements of the mandible.

3. Muscles are controlled through a mechanism of reciprocal innervation and reciprocal inhibition. All voluntary muscles have antagonists, whether they are other muscles, gravity or a combination of the two. Sherrington's investigations conclusively proved that as one muscle group (extensors or flexors) contracts, the antagonistic group relaxes. In opening the mouth, the stimulus that causes the upper head of the external pterygoid muscle to contract causes the antagonists, namely the temporal, masseter and internal pterygoid muscles, to relax at the same time. The muscles of mastication are highly coordinated through their innervation so as to permit complex jaw movements. They function not only in mastication, but also in deglutition and speech and in the maintenance of posture.

4. Normally, the suprahyoid muscles do not assist the external pterygoids materially to depress the mandible. The point of rotation for the normal opening movement of the mandible is at first in the region of the condyle. It then progressively descends as the mouth is opened.

5. The function of the suprahyoid musculature is to assist in the maintenance of the posture and equilibrium of the head, to maintain the position of the hyoid bone and associated structures at rest and during the various movements of the mandible, and to elevate the hyoid bone and larynx in deglutition.

6. The hyoid musculature can in time assume the function of opening the mouth if the external pterygoids cannot function, as in the case of resection of the condyles. When this occurs, the hyoid bone is pulled downward below the level of the symphysis of the mandible by the infrahyoid muscles. The suprahyoid muscles are then in a position of greater mechanical advantage to pull downward and backward on the symphysis.

7. The hyoid bone does not become fixed as stated by many of the anatomy texts in either the normal or the abnormal opening movements. In the normal, it follows an even downward and backward path, but it maintains a level above that of the symphysis. In the abnormal opening, it is pulled a considerable distance downward to a level below that of the symphysis.

8. If the hyoid musculature has become adapted to open the mouth, the movement of the mandible is a pure hinge action, and the point of rotation is in the region of the condyle. This hinge action takes place in the lower half of the temporomandibular joint between the head of the condyle and the meniscus.

9. The mandible is maintained in position by the muscles above and below it. The musculature, not the teeth, determines the position of the mandible. This rest position is established long before any teeth are present, and there is evidence that it exists after they have been lost.

BIBLIOGRAPHY

1. SHERRINGTON, C. S.: *Proc. Roy. Soc. London*, 92:245, 1921.

2. *Idem:* Notes on Certain Reflex Actions Connected with the Mouth. *Brit. D. J.*, 31: 785-790, 1910.

3. STEINDLER, ARTHUR: Mechanics of Normal and Pathological Locomotion in Man. Springfield, Ill.: Charles C. Thomas, p. 34, 1935.

4. BRODIE, A. G.: Graduate Orthodontia Notes. Department of Orthodontia, University of Illinois, 1939.

5. *Idem:* Biologic Aspects of Orthodontia, in Dental Science and Dental Arts (GORDON, S. M., editor). Philadelphia: Lea & Febiger, 1938, pp. 174-218.

6. *Idem:* Some Recent Observations on Growth of Mandible. *Angle Orthodontist,* 10: 63, April 1940.

7. HIGLEY, L. B.: Some Controversies Over Temporomandibular Joint. J.A.D.A., 27:594-602, April 1940.

8. CHISSIN, CHAIM: Ueber die Öffnungsbewegung des Unterkiefers und die Beteiligung der äusseren Pterygoidmuskeln bei derselben. *Arch. f. Anat. u. Entwickelungsgesch.,* 1906.

9. LORD, F. P.: Movements of Jaw and How They Are Effected. *Internat. J. Orthodontia,* 23:565, June 1937.

10. PRENTISS, H. J.: Regional Anatomy Emphasizing Mandibular Movements with Specific Reference to Full Denture Construction. J.A.D.A., 10:1085-1099, December 1923.

11. SICHER, HARRY: Phylogenesis of Human Temporo-Mandibular Articulation. *J. D. Res.,* 16:339, August 1937.

EXPERIMENTAL INJECTIONS OF FIBROSING SOLUTIONS INTO THE TEMPOROMANDIBULAR JOINTS OF MONKEYS*

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THE purpose of the research here reported was to determine the detrimental effect, if any, on the tissues forming and surrounding the temporomandibular joint when fibrosing solutions were injected and allowed to remain for a long period of time.

Since an animal in which the temporomandibular joint structure was similar to that of human beings was desired for experimentation, the Rhesus monkey was chosen for this particular research project. The solution used was "sylnasol," a solution that has been long used for injections in the treatment of hernia.

The literature is replete with opinions relating to various conditions affecting the temporomandibular joint and a brief reference to some of these may prove helpful in understanding the condition in which the treatment under discussion may be indicated.

1. Mary M. Bankebitch, Leningrad, Russia, who occupies a chair of stomatology at the State Traumatological Institute, has recorded her observation of a long series of cases. She makes the statement that the anomalies of occlusion, for example, inferior protrusion, unfailingly lead to chronic arthritis, which is sometimes complicated by habitual dislocation of the mandibular joints.

2. Redfern, after extensive observation of diseases of the articular joints in human beings, conducted exhaustive experiments on animals to determine the effect of alteration of nutrition or of trauma upon the articular cartilages of the joints. He conducted his experiments on lower animals as this enabled him to make observations on joint conditions that were uncomplicated by diseases of the human articular cartilages. He stated that the general results of these re-

*Histologic examination of the articular tissues made by the Department of Pathology of the Stanford University, School of Medicine.

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searches appear in the strongest manner confirmatory of the conclusions previously drawn from examination of the human articular cartilages. The results also were of importance in demonstrating that: (1) the changes of structure which result from the most varied injuries are of similar character in all cartilages; (2) these changes invariably affect both the cells and intercellular substances; (3) the only explanation of the nature of such changes is that they depend on an increased and abnormal nutrition of the texture; (4) the uncomplicated lesions of cartilage, especially such as have been artificially induced in lower animals, manifest a decided tendency to spontaneously heal by the production of fibrous tissue or by calcification of the whole cartilage left after the injury; (5) the fibrous tissue which heals up breaches in the texture of cartilage contains both the white and yellow fibrous elements, the former being produced by an actual conversion of the hyaline substance into it, and the latter by elongation of the discharged corpuscles of disease cells into the nuclear fibers, and (6) the disease action arising from the circumscribed destruction of the articular cartilage of the lower animal evinces no tendency to extend to the remaining part of these textures or to involve other structures and lead to serious disease of the joints. Among the various methods that Redfern used to produce irritation of the cartilage were surgical methods, the introduction of needles, ligatures and wires and the injection of acids and alkalis into the joints.

3. David J. Goodfriend, in commenting on various treatments of the diseases and disturbances of the temporomandibular joint, points with disdain to methods which employ injections of solution into the joint. He states that the experiments of Redfern are convincing evidence against medicinal injections. He calls attention to the fact that the irritating effect of the needle is probably the least harmful of the symptomatic treatment, but involves the possibility of joint infections, which cause more serious joint disease.

All of these potentialities are certainly worthy of consideration. They furnished some of the motives for the experimental work which I conducted on animals for a period of time sufficiently long to make it possible to determine the effect not only of intermittent insertion of the needle into the tissues of the joint, but also of repeated injection of the fibrosing solution. Goodfriend, in enumerating the etiologic factors in abnormalities of the temporomandibular joint, classifies them as clinical, anatomic and psychologic. He shows that the causes of abnormalities of the mandibular articulation are malocclusion, tooth destruction, disequilibration of masticating stresses and inflammatory processes of the teeth and jaws. He further points out that they may occur alone or in combination with the others and with or without toxic infection and infectious influences. He further states that joint symptoms are caused by abnormal pressure of the condyle and disk against an abnormal articular surface. This pressure is abnormal either because a part of the masticating tooth surface has been diminished or lost, or because the mandible has been displaced by occlusal abnormalities.

This multiplicity of etiologic factors casts a cloud over some of the simpler conditions, which may cause such common symptoms as dislocation, subluxation, popping or clicking in this joint. With full cognizance of the possibility of osteologic changes which would allow such abnormal movements, the fact is still evident that a weakened periarticular tissue could have an important rôle in allowing unphysiologic movement. The factors of retention, stabilization and limitation of the excursion of the condyle within the glenoid fossa are functions of the musculature and ligaments, and any lack of normal elasticity, dimen-

sion or physiologic tone may be an etiologic factor in an abnormal displacement productive of the previously mentioned symptoms.

Although immobilization may be indicated in many cases, we must not overlook the atrophic changes from disuse which may increase an already present impoverishment of the tissue. With these fundamentals in mind, it is not difficult to believe that if, in certain selected cases, the masticatory apparatus could be kept functioning, and the tissues responsible for limiting the condyle movement could be strengthened and stabilized, such treatment surely would be worthy of consideration.

It is upon this premise that the fibrosing treatment is applied to the temporomandibular joint.

4. Louis W. Schultz, in reporting an injection treatment for temporomandibular joint disarticulation or subluxation, describes his results in an exhaustive series of experiments to determine the most suitable type of fibrosing solution to be injected. He finally concluded that a 5 per cent solution of sodium psylliate was the most suitable solution to be injected.

5. Pendsen Butt carried on extensive investigations with regard to the chemistry of the seed of psyllium, or Plantago. He found that the seed has a large content of mucilage, but does not contain any alkaloids or glucosides.

Schultz's experiments were on dogs, with a series of from eight to ten injections of a 5 per cent solution of sodium psylliate per dog every two weeks. He showed that all joints were in perfect functional condition at necropsy at biweekly intervals. He also engaged in an exhaustive investigation to determine any possible deleterious effects of this solution when injected elsewhere in the body, including subcutaneous injections and injections into normal pleural cavities, into the gallbladder, into the left ventricle of the heart, the stomach, intestines and liver, as well as introduction of the solution into the peritoneal cavity. His experiment indicated that there was no alteration of the joint cavity, fibrosis occurring in the ligaments. There was no gross change in the ligaments other than thickening, and hence strengthening of the chief factors in holding the joints in their cavities. A subacute reaction followed thirty minutes after the injection of sodium psylliate. There was infiltration of leukocytes at this time; and two or three hours later, a lymphocytic infiltration started. Fibrosis of the tissue started in from four to six days. Injection into the joint cavity caused some discomfort. Injection of large doses directly into the blood stream was followed by no symptoms. Injection into the heart and other organs had no recognizable effect, and no infection followed the treatment.

Although Schultz's experiments, "Satisfactory Reports on Treated Human Patients," seemed quite adequate, there seemed to be a definite question in the mind of the author as to the ultimate or possible deleterious effect on a temporomandibular joint of a human being treated for a long period of time. It is for this reason that the experiments on the joints of monkeys, carried on over a long period of time, would answer a very important question before universal use of this solution should be advocated.

Schultz injects 0.25 cc. to 0.5 cc. of solution into each joint weekly or biweekly until sufficient fibrosis is obtained, stating that this requires from three to five weeks. In our experiments, the treatment was given weekly and the quantity injected was 0.5 cc. The animals were given an ether anesthetic to facilitate accuracy of injection. An endeavor was made to determine the amount of opening before treatment and again after treatment. No claim is made, however, as to the accuracy of these findings, for such factors as depth of anesthesia and degree of relaxation at the particular

time of measurement were indeterminable. However, the mouth could not be opened quite so wide without force. After weekly injections for one year, constriction of the opening was decreased from 2.5 cm. to 1.7 cm.; which seems negligible after such extremes of treatment. To determine the effect and result of varying the duration of treatment on the joints of opposite sides, as well as the end-results for both sides, two animals were selected for treatment and one was selected as a control.

Animal 1 was treated weekly for four months. Both sides were injected for six weeks, the right side for only eight weeks, and then treatment was resumed on both sides and continued for three weeks. Microscopic examination of the right and left temporomandibular joints revealed the following: The sections of the right jaw showed an area of roughening of the temporal surface and a thicker part of the disk. There was also some exudate composed of fibrin and consisting chiefly of polymorphonuclear leukocytes between the disk and the temporal bone. Some increase in vascularity and small clumps of lymphocytes was seen in the fibrous tissue between the joint and the parotid gland. The marrow was purely myeloid except in some spaces just beneath the cartilage in the temporal bone, where fibrous replacement occurred. Again, one section of the left jaw showed irregularity of the temporal surface, and some exudate between the disk and the temporal bone, but there was no other exudate and little or no change in periarticular fibrous tissue. The marrow spaces contained only myeloid tissue.

Summary.—The joint itself showed no real change. There was minimal periarticular reaction in the right jaw, but none on the left, and the cellular exudate in the joint cavity was full of fibrin and also represented an extremely mild reaction.

Animal 2 was injected weekly on the left side only, for six weeks, before treatment of the right side was begun. Both sides were then injected weekly for the remainder of the year. Microscopic examination of the right and left temporomandibular joints revealed the following: The changes were much alike in the two joints. It was not possible from examination to detect which had had the largest amount of treatment. In both, the joint itself remained intact, with its two serous spaces separated by an articular disk. The surfaces and disk were apparently unchanged and there was no cellular or fibrinous exudate in the joint. In both of the temporal bones, there were periosteal thickening and areas of fibrous marrow replacement. These changes were localized in the outer surface adjacent to the muscular attachments. In both, there was marked periarticular change. The fibrous tissue was cellular and rich in small vessels. It had some round-cell and macrophage infiltration and in places hemosiderin granules were numerous.

Summary.—The chief change was thickening and vascularity of the periarticular fibrous tissue. There was no evidence of chemical irritation within the joint cavity.

Animal 3 (control). Microscopic examination of the temporomandibular joints revealed the following: There was a rather thick cartilaginous head at the mandibular surface, a thin layer of cartilage cells on the temporal surface and a purely collagenous fibrous articular disk, which blended into loose fibrous tissue fitting the angles at each side of the joint. The marrow cavities contained only myeloid, no fibrous tissue. The surfaces of the disk and of the cartilage were perfectly smooth, and there was a thin fibrous tissue covering on the cartilages. The fibrous tissue in the edges of the articular disk and about the joint was almost avascular.

There was no discernible evidence of postoperative pain after consciousness

was resumed, and no interruption in eating habits or variation in food intake. The monkeys seemed to proceed in their normal habits and in their usual manner, partaking of food and liquids after injection with as much enthusiasm as before.

Immediately after injection on numerous occasions, swelling was noted, of a fluctuant nature and probably due to the excessive amount of solution injected and to the leakage of solution outside the joint cavities. This swelling was usually transient, disappearing within a day or two. On one occasion, this fluctuant swelling was still evident the following week. To determine whether it was an abscess formation or only a residual accumulation of solution from the previous injection, aspiration was employed. The aspirated fluid appeared to be a serous exudate containing some of the solution from the previous injection. Injection of this side was resumed the following week without subsequent recurrence of this episode.

These results quite obviously confirm the results reported by Schultz on other animals and reveal the absence of deleterious effects of injecting sclerosing solutions into the temporomandibular joint when such treatment is indicated. Employment of this treatment is still a matter of clinical indication, and it is not my belief that such treatment should be considered a panacea for all affections of this joint.

The duration of thickening of the periarticular fibrous tissue, which is still to be ascertained, will be presented when these facts are known. However, recurrence of symptoms of dislocation in human beings would be an obvious indication for resumption of treatment if the primary course of injections did not effect a permanent cure. Patients with a generally low muscular tone and manifesting other systemic deficiencies should, of course, be treated accordingly.

If restabilization can be accomplished by such treatment, such end-results as roughening of the surface of the joint cavity or the head of the condyle or irregularity and crumpling of the interarticular disk may be prevented. By inhibiting the unrestrained condylar movement and preventing the condyle from assuming unphysiologic positions, more serious and permanent damage to the tissues forming and surrounding this joint may be prevented. Treatment in the past has been so inadequate and unsatisfactory that due consideration should be given this method. Even when other etiologic factors may be evident and require treatment, this may be employed as an augmentary measure where restraint or immobilization had previously been considered.

BIBLIOGRAPHY

REDFERN, P.: *Month. J. M. Sc.*, 10, 1850.

GOODFRIEND, D. J.: Abnormalities of Mandibular Articulation. J.A.D.A., 21:204-218, February 1934.

SCHULTZ, L. W.: *J.A.M.A.*, 109:1032-1035, September 25, 1937.

BUTT, PENDSEN: *Proc. Acad. Sc.* (United Provinces, Agra, Oudh, India), 4:133, 1934. (Chemical Abstracts 297577.)

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VALUE OF THE ROENTGEN RAYS IN PARTIAL DENTURE PROSTHESIS

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THE roentgen rays have played an important rôle in the advancement of dentistry. The study of dental structures is not complete without roentgenographic information. This applies, therefore, to partial denture prosthesis. Perhaps the average practitioner thinks little of roentgen information when dentures are considered. Nevertheless, such effort is worth while from the standpoint of both diagnosis and prognosis.

That department of our work known as full denture prosthesis is the court of last appeal for dental restorations. Everything else has failed and, to some extent, it represents the graveyard of conservative treatment, for, in most instances, we have been unable to cope with the ravages of dental disease. All such failures cannot be laid at the door of the profession, for there are other contributing factors in the edentulous mouth, such as environment, accidents and congenital and hereditary conditions. However, the vast majority of denture patients have been rendered edentulous because the etiology of caries is unknown and we are unable to cope with marginal destruction of the supporting dental structures.

When the patient must face the inevitable and be satisfied with the best that science can produce in full denture construction, he is told that dentures are just about 20 per cent efficient, as compared with natural dentures, for masticating purposes.

In partial denture prosthesis, because we are one long step away from the court of last appeal, great care must be exercised to delay the final step, as far as is consistent with maintaining the good health of the patient and, at the same time, to preserve a good ridge foundation for future denture construction. Therefore, the remaining teeth in the arches must be carefully examined so that they may be retained to the patient's advantage. We must diagnose the condition of the partially edentulous mouth, so as to maintain as high a percentage of efficiency as possible above the 20 per cent efficiency already credited to full dentures in serviceability. Such examinations require time, care and judgment. These steps, such as clinical inspection of the ridges and their relationship to each other, the tongue, throat, tissue resiliency, etc., are well known to all, but roentgenographic information is equally important and must be resorted to, if we expect to render the maximum service.

Radiodontia or oral roentgenography is exacting in every phase. Roentgenograms are shadow pictures and shadows can be distorted and thereby lead one to wrong conclusions, unless due care and consideration are always used. First, in prosthesis as in every department of our work, the general health of the patient must be considered. Therefore, a careful roentgenographic survey should be made to determine the value of and the potential serviceability of the remaining

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teeth and the condition of the bone in the edentulous spaces.

Roentgenographic information is invaluable for the remaining teeth, since the elimination of sepsis is desirable in any dental operation. Aside from periapical involvements, there are other important considerations, such as the discovery of caries in any of the remaining teeth, the likelihood of pulp involvement

Fig. 1.—Correct angulation.

Fig. 2.—Incorrect angulation of structures shown in Figures 1 and 3. There is an apparent change in the pattern of bone.

Fig. 3.—Correct angulation.

by cavities, the position of the pulps in teeth to be used for anchorage, the depth of fillings or their proximity to the pulp, and the shape and length of the roots, and, should canal surgery be necessary, all factors relative thereto must be studied roentgenographically. The position and condition of the pulp in teeth which are to be used to stabilize a denture are very important and due consideration of them may save the operator embarrassment. The proper use of a reliable vitality testing machine is a valuable adjunct in most instances. Preparations and restorations can be made more safely and quickly when roentgenographic information is secured in advance. Time can be saved and failures avoided.

The condition of the remaining teeth

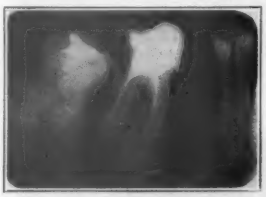

Fig. 4.—Incorrect angulation of structures shown in Figures 1 and 3. There is an apparent change in the pattern of bone.

Fig. 5.—Correct angle of projection.

Fig. 6.—Incorrect angulation. The change of bone pattern is apparent.

in a case of partial denture prosthesis must be ascertained, and it is assumed that these teeth have received the care necessary to render them free of infection, if necessary, and also to have each individual tooth properly cared for in advance. We must not overlook marginal loss of the alveolar process from around the remaining teeth, and must

note the cause or causes of the destruction, so that corrective means may be successfully administered; otherwise, the prognosis for serviceable partial dentures would be unfavorable.

Now the condition of the bone in the

Fig. 7.—Correct angle of projection.

Fig. 8.—Incorrect angulation. The change of bone pattern is apparent.

Fig. 9.—Incorrect angulation. The change of bone pattern is apparent.

Fig. 10.—Correct angle of projection.

edentulous spaces must be determined, and the most dependable information can be secured by the use of the roentgen rays. It has been stated that in 25 to 35 per cent of edentulous arches, there remain conditions that should be corrected before reconstruction of the dental arches is started. There are several findings of interest aside from the texture of the bone. Our exodontists are skilful men and, on the whole, render excellent service, but of course most teeth are not removed by the specialists, and it is not unusual to find root fragments in the bone after extractions, and frequently

Fig. 11.—Incorrect angulation. The change of bone pattern is apparent.

Fig. 12.—Area of residual infection not disclosed in Figure 13.

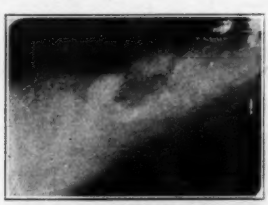

Fig. 13.—Area responsible for fistula in edentulous jaw, of twelve years' standing. The difference in pattern of bone is the result of foreshortening of the image.

there is no clinical indication of their presence. These fragments represent the greatest necessity for roentgenographic information on bone conditions. Other occasional findings are bone cysts, areas of residual infection, necrotic bone, impacted teeth, especially the cuspids and

third molars, supernumerary teeth and evidences of bone disease. These conditions, if not discovered, would prove unfavorable from the standpoint of mechanical dentistry as well as from the standpoint of the health and comfort of the patient. Thorough examination as well as eradication of all conditions not conducive to health, comfort and service is of primary importance.

We occasionally see references to roentgenographic information regarding bone density and the value of such information as a guide to prognosis as to the life and serviceability of a denture. Several terms have been used to convey the texture of bone, such as osteoporosis, osteosclerosis, mineralized and demineralized, hypercalcium and hypocalcium. I find that all prosthodontists do not agree as to the value of this information. Some have said that if a partial denture is necessary, worry about the texture or the density of the bone is unavailing. This of course is true, and yet a bone which evidences considerable calcium is harder and more resistant and will withstand greater stress from dentures with less evidence of atrophy than bone of the so-called hypocalcium type.

It is interesting to study the different types of bone. However, as a radiologist, I am skeptical of one who endeavors to place too much credence in x-ray information on this point unless his roentgenograms have been produced with the utmost precision. A change in angulation of the rays on the same structures will disclose a different pattern of bone. The bone will appear at a given angle, with wide open spaced trabeculae indicating a hypocalcium classification, and a change in the angle of projecting the rays on the same structures may reveal smaller trabeculae with narrow spaces and having the general appearance of a denser bone. Nevertheless, the roentgenogram is of value for definite information about edentulous bone, as well as for the teeth themselves, but the same exaction in technic and processing of the film must be carried out.

ANGULATION

Correct angulation is essential for securing dependable information regarding the teeth and surrounding structures. If the angles of projection are incorrect, accurate interpretation cannot be made.

After conferring with several prosthodontists, I find that most men appreciate roentgenographic information as a guide to density or lack of density of the maxillary bones. Cases of closely knit cancellous bone structures wherein the spaces between the trabeculae are relatively small and classified as hypercalcic do withstand the rigors of stress under dentures made necessary in the usual process of mastication, and a more favorable prognosis can be safely made. When the reverse is found in a well made roentgenogram, we can predict that bone atrophy will occur under masticatory stress and that rebasing of such dentures will be necessary from time to time.

It is always difficult to explain an inevitable condition after it takes place, but to foresee and to anticipate its development and to make a corresponding prognosis at the right time saves much embarrassment to the dentist and indicates honesty of purpose and genuine regard for the patient. It is remarkable how well the tissues respond to and tolerate the constant presence of some mechanical contrivance, such as a denture. There is really little unfavorable reaction recorded in the osseous structures, but bone atrophy must be considered as a possibility, especially when certain types or patterns of bone are recorded roentgenographically.

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A SURVEY OF THE DENTAL SERVICE IN STATE MAINTAINED MENTAL INSTITUTIONS OF THE UNITED STATES

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FOREWORD

THIS survey was undertaken with a view to gathering accurate data that were not available from any one source on the extent of the dental service furnished the patients, and incidentally the employes, of the state maintained mental institutions in the United States. It was carried out by means of a questionnaire sent to the 175 institutions listed under this head in the American Medical Directory. The results as herein compiled are based upon replies received from 164 of these 175 institutions receiving the questionnaire.

The question blanks were addressed to the superintendent or managing officer of each institution, who with but two exceptions were physicians, and the responses generally showed marked interest in the inquiry. The cooperation in the effort, except for delays in some instances, was extremely gratifying, and is herewith acknowledged. In many instances, letters of comment and explanation accompanied the returned questionnaire, and it is regretted that for lack of space these cannot be incorporated in this report. A desire for copies of the data when compiled and assembled was evidenced by more than 90 per cent of those replying.

The items of the questionnaire itself were chosen to bring out what seemed to be the pertinent and essential points of interest and information, with avoidance of a long and involved series of questions that would preclude the possibility of a high ratio of response, and with the thought that after these essential data were compiled, perhaps a later inquiry directed to the dental officer of each institution might be indicated to elicit more detailed information as to actual routine, function and results of the dental service in hospitals of this nature.

There follow a copy of the questionnaire, résumé and comment on the findings, conclusions drawn from the information received and, finally, a short history, covering the present day status, of the dental service of the institution from which this inquiry emanated.

QUESTIONNAIRE

State
Name of institution
City in which institution is located
Name of superintendent
Name of dental officer

1. (a) Total number of patients in your institution. (b) Total number of employes.
2. (a) Does your institution have a dental clinic? (b) If so, number of chairs or operating rooms.
3. (a) Number of full time dentists employed. (b) Part time. (c) Dental interns.
4. (a) If part time or visiting service is used, please give number of hours devoted to this service per week. (b) Per month.
5. (a) Does your clinic include laboratory facilities? (b) A laboratory technician?
6. If no laboratory or technician, what is your routine in connection with the construction of replacements?
7. (a) How many dental assistants employed? (b) Dental hygienists?
8. (a) Are dental examinations made of all newly admitted and returned patients?

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(b) Are periodic dental reexaminations and corrections made thereafter?

9. (a) Is your dental service a complete one, embracing all operations and replacements common to modern general practice? (b) If the service is limited to certain operations or replacements, please note such limitations.

10. (a) Is all of such dental service as is given the patients in your institution furnished without cost to them, their guardian or relatives? (b) If not, please note fully such exceptions as are contingent upon the patient's, or his guardian or relatives' ability to pay for it.

11. Do you consider your present dental service for the patients adequate?

12. (a) What dental service is provided for the employes of your institution? (b) Are they charged for this service? (c) At current fees?

13. Other data or information explanatory of or in addition to the foregoing.

RÉSUMÉ AND COMMENT

Mental hospitals on the whole throughout the country have unquestionably suffered a slower development as to personnel and facilities for the treatment of the mentally sick than has been the case with hospitals devoted to the care and treatment of other types of human illness.

It would appear that there are several factors in this condition. These hospitals are for the most part state maintained, and for the commitment of the indigent—charity hospitals, in short—dependent for funds on appropriations from legislative bodies, the members of which are in some instances not too well informed concerning the needs of this type of patient other than custodial care. This, of course, reflects the general public attitude, based upon ignorance and misinformation concerning mental disease, resulting in a reaction of fear, ridicule or indifference toward the mentally sick. Moreover, a potent deterrent to the development and progress in this type of hospital that has existed largely in the past and still obtains in some states is the matter of such frequent changes of personnel and policy as are due to the political aspect of state institutions, and because of which men of reputation and standing in the professions were not drawn to such institutions.

It would seem, then, to be the province of the professions engaged in ministering to this sort of illness to assume some responsibility for the improvement and development of both physical facilities and technic in the treatment of this vast number of sick people, who constitute a greater percentage of hospitalized individuals than the total of those occupying hospital beds from all other causes.

As the first step toward the assumption of its responsibility by the dental profession as one of the groups contributing to the institutional treatment of this type of patient, it is obvious that we should be informed as to its present status of efficiency in this regard, with a view to the correction and improvement of conditions relating to the dental health of the patients confined in these hospitals. With this end in view, this survey was made and its findings are here evaluated.

The distribution of state mental hospitals throughout the United States appears to be in the main in accordance with the general population distribution. Every state maintains at least one such institution, and many maintain more than one. New York leads with more than twenty, Massachusetts has fourteen, Illinois eleven, Pennsylvania nine, Ohio eight, California, Indiana and Texas six each, Oklahoma, Iowa, Michigan and Minnesota five each and the remainder from one to four each.

The patient population in the 164 institutions reporting varies from approximately 1,000 (a few with less) to 8,500; a total of 357,948, or an average of 2,182 patients per institution. The number of employes in these hospitals is 62,171, or an average of 379 each.

A study of the replies to the questionnaire reveals a wide variety of arrangements for dental service for pa-

tients and employes as regards the extent of full and part time dentist personnel, incidence of intern, hygienist, assistant and laboratory technician employment, provision of physical facilities, character of service authorized and remuneration.

All reporting institutions except two have some facilities in the way of operating space, offices or clinics for carrying on this work. Laboratory space and equipment is part of the service in seventy-six instances. Physical improvement and additions are reported for the immediate future in several institutions.

The total of the dentist personnel for the 164 hospitals reporting is 148 full time or resident men. Part time dentists only are used in forty-four institutions and seven have part time service in addition to that of those in residence. Only one institution reports no provision whatever for dental care of patients. It was difficult, from the nature of some of the replies, to determine accurately the number of interns. The question concerning this group was designed to obtain information regarding the number of full time graduate interns attached to this service, and did not refer to students associated with this work during the summer months, etc.

With the 148 full time operators, and computing as nearly as possible the number of actual interns as fifteen, and the hours per week or month service of the part time personnel as equal to twelve full time dentists, a total equal to 175 full time men is arrived at as engaged in this work, or an average of one for each 2,045 patients. This is not far from the dentist : population ratio throughout the country, where it is a well-recognized fact that less than 30 per cent of the public avails itself of other than emergency dental treatment and corrections.

Breaking down the dental personnel still further reveals that ninety-four of the reporting institutions have one full time dentist each, sixteen have two full time dentists each, six have three each and one has four. Forty-four have no full time dentist, employing a part time service only, varying from a high of twenty-four hours per week to a low of six hours per month. Thirteen institutions apparently have posts for interns. For the most part, the interns are made use of in connection with full time dentists. In two instances, however, an intern is employed in connection with a part time arrangement, and in one case is the institution's only dental officer.

The dental technician distribution is found to be less constant than the professional personnel. While seventy-six institutions report laboratory facilities, only twenty-seven have technicians. Those without technicians largely patronize commercial laboratories, if their service includes prosthetic replacements. In others with laboratory facilities, such prosthetic work as is done is performed by the full time dentists themselves, by the interns or by dental assistants, and in some cases of a visiting service only, this work is done in the visiting dentist's personal laboratory.

A total of ninety dental assistants are employed in sixty-five of the reporting institutions and forty-two dental hygienists in thirty-seven institutions.

One hundred fifty-three replies indicate a routine of dental examinations of all new and returned patients, while eleven do not. One hundred forty-one state that periodic reexaminations and corrections are made, while twenty-three institutions do not follow this practice. It would appear questionable in the many instances of institutions with large patient population and limited dental personnel how thorough and comprehensive these examinations, reexaminations, treatments and corrections can be.

In 110 institutions, the extent of the authorized service is reported as a complete one, covering all operations and replacements common to modern general

practice, while in fifty-four limitations exist of the extent of the service authorized. These limitations in most cases involve replacements such as bridgework and dentures, gold and porcelain.

Only thirty institutions furnish without cost all of such service as is authorized. The 134 others report exceptions to a free service, which seem to be also in the matter of replacements, gold, etc., which are contingent on the patient's or his relative's or guardian's ability to pay for, or, in some instances, the patient's ability to work for. It is observed that ninety-four institutions make no provision whatever for the dental health of their employes and fifty-two have emergency provision only, for which in some instances a fee is charged. The remaining eighteen have a variety of arrangements, ranging from a few with service identical to that given the patients, which in itself in many instances is incomplete, to a complete service after clinic hours at full or reduced fees. In general, it appears that the dental health of the employes is largely ignored as far as the policy of the institution clinic is concerned.

It is encouraging to note that seventy-nine, or nearly one half, of the replies to the questionnaire express the belief that the dental service is inadequate, particularly when it is taken into consideration that the questionnaire was directed to and filled out by the superintendents of the institution involved, who in virtually all instances were physicians, with a naturally less acute interest and concern for this portion of the service than would be expected of the dental profession. On the other hand, it is obvious, from a study of the returns, that, in many of the instances in which the service is termed adequate, it palpably cannot be so in institutions of more than 1,000 patients with a part time service, and others of 2,000 and more with perhaps one resident full time dentist and no laboratory technician, dental assistant or dental hygienist.

The responses to question 13 which asks for additional data or information were most interesting. In many instances, realization of the need for additional personnel and broadened service is voiced, although, in some cases, the thought is expressed that the service is adequate and that no greater attention is indicated for these sick people than for those in the usual walks of life.

A striking fact brought out by the survey is the lack of uniformity or standardization of the dental service in mental institutions, which the country over are engaged in treating identical illnesses. In the few instances, where a reasonably adequate service is maintained, the efficiency of the dental care seems to be the result of local enthusiasm or initiative, with little or no definite plan governing even the several institutions of a given state, and no predetermined patient: dentist ratio applying to this work for any or all institutions.

It is noted that at least two comments refer to complete roentgenographic examinations of the mouths of all patients. This should be routine in all dental examinations as it has been determined that besides the recognized amount of hidden disease in the average mouth carrying teeth, more than 30 per cent of all supposedly edentulous mouths contain retained roots, cysts and other pathologic conditions involving residual infection, which is definitely a hazard to physical health as well as to the toxic types of mental illness.

It is to be regretted that the tabulated returns from the questionnaire cannot be included in the present report. A close study of these tabulations would doubtless serve to bring out points of interest to the individual observer that perhaps are not completely covered or sufficiently stressed in the foregoing résumé. These tabulations are available at the source of this survey, and will be furnished

promptly to those interested. It might be suggested that in evaluating these returns, consideration be given to the questionnaire method of obtaining them. The use of this method, it is believed, results in many instances in eliciting a sanguinary rather than a depreciatory report in connection with any subject involved in a survey of this nature.

CONCLUSIONS

1. Aside from a comparatively few institutions, which, perhaps because of the interest, initiative and aggressiveness of the dental officer or staff, the belief of an individual superintendent or governing body in the need for an efficient dental service or as the result of some other unusual set of circumstances, have evolved a relatively comprehensive and efficient dental program, this phase of the treatment of the mentally ill is definitely inadequate in state maintained mental institutions in the United States, the large majority of such institutions being understaffed and underequipped to render the service indicated. Assuming that the dentist: population ratio is relatively the same as obtains in the country generally, the following items must be taken into consideration if this comparison is to be used in determining the dental needs of these hospitalized people: (a) Less than 30 per cent of the population of the country avails itself of such dental treatment and service as is indicated. (b) The need for a much greater personnel and much more service for the patients of these institutions than for the unhospitalized public will be apparent when it is realized that these patients as a rule represent an underprivileged adult group that upon hospitalization present gross dental neglect and disease requiring much more dental treatment than the average individual of the 30 per cent of the general public who avail themselves of complete dental service. (c) Because of their physical and mental handicaps, more sittings or visits are required for any type of dental treatment. (d) Regression is much faster in this type of patients, requiring more frequent reexamination and replacements owing to their physical limitations and mental incapacity, sometimes extending over long periods, and to their group method of life, making personal prophylactic measures extremely difficult.

2. Anything less than a complete dental service, embracing all operations and replacements common to modern practice, should not be considered in these hospitals, and any policy that bases the patient's eligibility for dental treatment or replacements upon his ability to work or produce a service for the institution, or upon his financial status, is basically unsound, and carries a penal rather than a hospital aspect. Dental treatment should be an integral part of the general health service, and no class of these indigent committed patients should be denied this full service because of inability to work or pay, any more than they should have a partial medical or general care based on these conditions.

3. The total lack of any uniformity of the dental service in this class of institution is most apparent, as to both physical provisions and personnel, and it is altogether probable that this situation has never come to the attention of any agency of organized dentistry. The minimum standard for physician and dentist personnel as set up by the American Psychiatric Association provides that: "There must be an adequate medical staff of well-qualified physicians, the proportion to the total patients to be not less than 1:150 in addition to the superintendent. There must be one or more full time dentists. The treatment facilities and equipment must include a dental office supplied with modern dental equipment." It will be seen that the forty-four institutions in which only a part time dentist is employed are below even these meager requirements in the matter of personnel, and the lack of any

definite dentist-patient standard set forth for the dental service is noticeable. Moreover, it is doubtful whether even the vague physical requirements are met in many institutions. It would appear that one of the initial steps toward raising dental service standards in this class of institutions should be a definite minimum personnel: patient ratio arrived at by some agency of organized dentistry itself, and incorporated in the minimum requirements of the American Psychiatric Association. This should provide for a dentist: patient ratio of certainly not less than one full time dentist to each thousand patients, as well as more specifically described physical facilities if they are to be mentioned at all.

4. Sufficient dental care should be provided for employes of these institutions to keep them free of mouth disease, and with such replacements as would restore them to a reasonable degree of masticating efficiency at fees based on the material cost involved. Even large commercial organizations have found dental care for their employes a dividend-paying policy in the matter of employe health and efficiency.

5. If the institutional care of mental patients were to be broadened to include complete dental service and reasonable resident personnel, an exceptional opportunity would be opened for dental internships in such institutions. Besides augmenting the permanent personnel to the resultant benefit of the service, no finer clinical facilities would be available in the country for the additional training which is recognized by the medical profession as necessary for its young graduate, but which the dental profession has been slow to recognize. Many states have no provision in their dental laws for dental internships, a fact which certainly adds nothing to the status of dentistry as a profession, and which neglects an opportunity for additional training and experience that would unquestionably be of benefit not only to the individuals concerned, but also to the public they are to serve.

6. Institutional practice would offer a remarkably fine field for dental hygienists in the circumstance that complete dental service were realized for these institutions. To many comparatively young members of the profession who have not been able to establish themselves in private dental practice, this institutional work would offer an opportunity for hospital service in a field where prophylaxis is a highly important item of therapy.

7. Highly developed, efficient dental clinics and complete dental service are a practical possibility in state mental institutions, as has been demonstrated by the several such clinics now in operation, their existence being more than justified by their proved contribution to the physical and mental health of these committed patients.

8. As a final conclusion, the conviction cannot be avoided that this institutional dental service, contributory to the health of perhaps 400,000 indigent persons, constitutes a public health problem of no small proportions with which organized dentistry could well concern itself. That these state hospitals, largely without the interest or concern of the dental profession, have attained even their present status in the matter of this dental health service is rather remarkable. Our local, district, state and national organizations have demonstrated an interest in public health in many ways, have fostered research and development of a scientific nature, are alert in demanding legislation for the protection of their own interests and those of the public generally and, without question, constitute the organized potent force that can be effective for the raising of dental standards in this field of practice involving these helpless and confined persons.

DENTAL SERVICE OF THE FLORIDA STATE HOSPITAL

In completing this report, it seems pertinent to offer a brief factual record of the development and present-day status of the dental service of the institution from which this survey emanates, as perhaps a basis for recognition of the possibilities that lie in the establishment of adequate dental care for the patients of such hospitals throughout the country.

In 1926, with a patient population of 2,331, the dental personnel of this institution consisted of one dentist, the service of emergency attention only. In that year, provision was made for a staff of two dentists, physical facilities were improved and enlarged considerably and a young man and two young women were taken from other departments of the institution to be trained as laboratory technicians and dental assistants, respectively.

A complete record system was set up, regular examination of all newly received patients was instituted and the indicated treatment for them proceeded to completion as rapidly as possible. For the patients already in the institution, examinations and corrections were made as rapidly as time and personnel would permit, until eventually every patient in the institution had a dental record and had been brought to a reasonable degree of dental health and efficiency.

From these beginnings, the growth and development of the clinic over the fifteen-year period to date have been constant, the patient population now having reached 4,729. The staff at this time consists of a chief dentist and three assistant dentists and there is a post for a graduate dental intern. Two dental technicians, five dental assistants, a record clerk and stenographer, maids and a porter make up the remainder of the personnel. In physical aspect and equipment, the clinic is unsurpassed by anything of like nature in the country. It occupies a building of its own and functions as a distinct and separate unit of the health service of the institution. It comprises five general operating rooms (one of which contains the x-ray machine), a sterilizing room and two reception rooms for white patients and employes; one operating room, sterilizing room and reception room for colored patients and employes; a surgical unit composed of operating room, sterilizing room, linen room and recovery room; a completely equipped laboratory; dressing and locker rooms for man and woman personnel; a record clerk and stenographers' office, and a library containing 200 dental volumes and all current scientific magazines.

The service to the patients is complete, embracing all operations and replacements common to modern practice except orthodontia and extensive root-canal therapy. It is without cost to patient, guardian or relatives and in no manner limited as to quantity or quality of materials required. All incoming patients are examined within a week of admission. All oral disease is immediately eliminated and, as rapidly as possible, the patient is brought to a degree of dental efficiency considerably higher than is common among the public generally. The routine then involves reexamination and corrections for each patient at periods of three, six, nine or twelve months thereafter, depending on the indications therefor.

An average year's work in the clinic is represented by 1,200 examinations, 6,000 reexaminations, 25,000 operations, 22,000 sittings, 5,000 extractions, 4,000 fillings and inlays of all types, 800 dentures, full and partial, 350 pieces of fixed and removable bridgework, 1,500 roentgenographic examinations, 5,000 prophylaxes, the placement of many porcelain jacket and posterior gold crowns, etc.

The dental care for the regularly employed personnel of the institution as

listed on its payroll consists of such treatment as will eliminate oral disease or injury, and such replacements and restorations as will provide a reasonable degree of masticating efficiency and restore the personal appearance. A nominal charge is made, based on the cost of material used, for only such service as involves replacements or restorations.

The clinic and its service has enjoyed the complete support of the several superintendents of the hospital and the board of commissioners of state institutions throughout the entire period of its development, and its present status is of course due in great measure to this fact.

The work of conducting this survey, assembling the data obtained and arriving at some conclusions concerning it has constituted a most interesting project. It is believed to represent an authoritative report of the conditions under inquiry. Great care has been used to present an accurate picture of the situation, and indulgence is asked from the institutions involved for such small errors as may have crept in owing to misinterpretation of replies or changes that have taken place since the survey was initiated.

IMPACTED, UNERUPTED UPPER DECIDUOUS FIRST MOLAR: REPORT OF A CASE

By HARRY H. BLEECKER, D.D.S., and CARL D. LUCAS, D.D.S., Los Angeles, Calif.

History.—A boy, aged 15, presented permanent upper left central and lateral incisors, first bicuspid and first molar in complete eruption, the cuspid in three-quarter eruption, the second bicuspid in half rotation with the tips of its cusps showing in normal position and the first molar tipped forward at an angle of 15 degrees.

A routine roentgenographic, orthodontic set of negatives demonstrated the presence of (a) a supernumerary tooth or (b) the crown of a deciduous molar tooth located immediately above the incompletely calcified end of the second bicuspid, its root being calcified to its proximal apical two-thirds.

The unerupted tooth was directed downward at an angle of 15 degrees, with its root portion within the osseous floor of the left maxillary sinus and with plastic tissue only above its root.

The unerupted tooth was removed (1) to facilitate orthodontic positioning of the incompletely erupted second bicuspid in the maxillary arch, (2) to assure complete calcification of its root and (3) to safeguard the left maxillary sinus against possible pathologic disturbance.

At operation, the tooth was found to be a deciduous upper left second molar with its roots resorbed to the enamel margin of the crown, with the exception of a conical projection of the lingual root approximately 3 mm. long and 3 mm. wide at its base. The dentinal support of the distolingual cusp had resorbed and the distolingual fissure was carious.

Operation.—A crescent-shaped mucoperiosteal flap, directed downward, was made, about 4 cm. in length, and the unerupted deciduous molar was removed through a window in the buccal alveolar diploeic bone, without disturbing the apical portion of the crypt of the second bicuspid. The plastic tissue above the unerupted deciduous molar was not perforated, the lining of the floor of the maxillary sinus being left intact. The area operated upon was sterilized with 95 per cent phenol and 70 per cent alcohol and the flap was sutured to position with silk sutures, which were removed the third day after the operation.

Comment.—As the tooth follicle of the second bicuspid was not traumatized, the tooth should progress to complete calcifi-

cation. However, frequent roentgenograms will be made to observe the progress of calcification as orthodontic measures proceed in moving the first permanent molar distally to create space for eruption of the second bicuspid, which, after eruption, will be half-rotated into normal arch position.

CONCLUSION

The first permanent molar normally begins to calcify in the eighth fetal month. As its calcification proceeded, its crown developed a mesial inclination, thereby constricting the space for the deciduous second molar, which should have erupted by the twenty-fourth month. The deciduous first molar, which erupts at the fourteenth or fifteen month, erupted in normal arch position and lack of space between the deciduous first molar and the first permanent molar prevented eruption of the deciduous second molar.

Fig. 1.—Roentgenogram showing an unerupted deciduous second molar located immediately above the calcifying root of an incompletely erupted upper second bicuspid.

The tooth bud of the second bicuspid, which arises from the secondary lamella on the lingual side of the primitive tooth band, was deposited lingually from the unerupted, impacted deciduous second molar, and its calcification, which begins the fifth year, proceeded normally, with the deciduous second molar above the forming root of the second bicuspid.

Malposition of the unerupted deciduous second molar, above and slightly toward the buccal aspect of the developing root of the second bicuspid, forced the bicuspid to assume a half-rotated position within its follicular crypt.

Calcification of the first bicuspid begins in the fourth year and it normally erupts at the tenth to the eleventh year, assuming the position of the deciduous first molar. Eruption of this tooth into its normal arch position and mesial presentation of the crown of the first permanent molar retarded eruption of the second bicuspid, which should be in normal arch position in the twelfth year.

Fig. 2.—Unerupted deciduous second molar after its removal.

Since this is the first case that we have observed of an unerupted deciduous second molar located immediately above the calcifying root of an incompletely erupted upper second bicuspid, we assume that a report of the case, together with the roentgenogram and a picture of the unerupted deciduous second molar after its removal, is of interest.

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ROENTGENOGRAPHIC INTERPRETATION OF CERTAIN CONDYLE AND MENTON MOVEMENTS

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THE action of the condyle during opening movements of the mandible has been discussed in the literature by various investigators. Although all seem agreed that the condyle possesses both a hinge and a gliding action, there is a definite difference of opinion relative to the time of occurrence of certain of these condylar movements as the jaws are opened. Probably the most important of these is the question as to whether it is possible for the condyle to exhibit only the hinge action and thus retain its centric relationship (starting point of condylar movement or the most comfortable posterior position in the glenoid fossa) during any phase of mandibular opening.

Prentiss,[1] Lord,[2] Brodie,[3] Chissin[4] and others have pointed out that this gliding hinge type of movement of the mandible is brought about by the contraction of the external pterygoid muscle. This typical action of the condyle is due to the fact that the fibers of this muscle pass downward and around the eminentia articularis to be inserted in the meniscus and anterior surface of the neck of the condyle. The meniscus, in turn, passes over the condyle head and downward to be inserted in the posterior surface of the neck of this structure.

During these muscular movements, the eminentia articularis changes the course of the meniscus and external pterygoid so that it serves as a pulley, the downward and forward movement of the condyle resulting as this muscle contracts and the jaw opens. Todd[5] says:

> If one watches the movement of the condyle on the roentgenoscope, it is quite evident that opening of the mouth can take place without any forward and downward displacement of the condyle, but it is also evident that this does not occur without definite effort. Unless instructed to move the jaw in this particular manner the subject under observation will, on opening the mouth slowly, just drop the mandible slightly so that there is an appreciable interval between the upper and lower occlusal surfaces during which movement the condyle can be seen to slip downward and forward.

Prentiss and Lord maintain that "the condyle does advance whenever the jaw is opened." Charles E. Luce, in the *Boston Medical and Surgical Journal,* as early as 1889, says ". . . the condyle moves forward as the chin descends." Hildebrand[6] states that ". . . in straight sagittal opening the condyle goes, as a rule, down onto the articular tubercle in ventral gliding." Chissin asserts that "the contraction of the upper head of the external pterygoid muscle (sphenomeniscus) causes the condyle to roll and come forward, which contraction is principally concerned with the first phase of opening."

On the other hand, it is stated in most textbooks and by McCollum and others that the external pterygoid has nothing to do with the opening movements of the mandible, but that this opening is the result of the contraction of the suprahyoid group of muscles. If this were true, the opening movement of the mandible

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might be confined primarily to a hinge action when the jaw is opened, without any forward movement. McCoilum says:

> It is fallacious to believe that the heads of the condyles move forward immediately on opening the mouth. Facebow tests show that the incisal opening is always at least half an inch, and may be as much as an inch and a half before the condyle starts forward.

In addition, certain investigators have shown that the point of the chin drops downward and backward in the arc of a circle as the jaw opens. However, McCollum states that, reflexly, when a patient opens the jaw, a slight protrusion accompanies the downward movement.

Because of the contradictory statements regarding the movements of the mandible, particularly that of the condyles, this study was carried out, in an attempt to analyze the condyle action as evidenced in a roentgenographic examination.

EXPERIMENTAL PROCEDURE

Fifty-eight persons, aged 19 to 27, with relatively normal occlusion, were selected for the investigation. The roentgenographic technic used was one described by one of us (L. B. H.).[7] The subject's head was oriented in the Frankfort plane and related to the tube so that the external auditory meatuses were on the axis of the central ray. The head positioner was then rotated 20 degrees on its vertical axis and tipped 4 degrees on

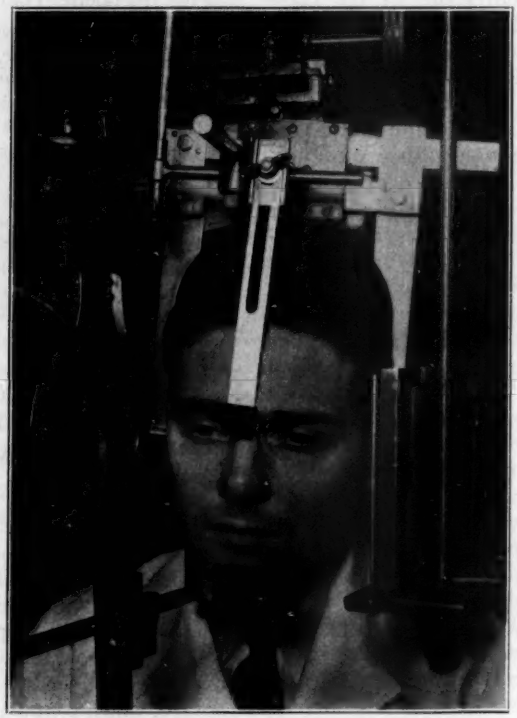

Fig. 1.—Patient oriented in head positioner for taking of roentgenogram. The instrument is adjusted to measure the position of the chin point with reference to the horizontal and vertical planes.

its horizontal axis. This places the crest of the eminentia in line with the mid-central ray. The left area was roentgenographed so it was rotated posteriorly and tipped downward. The casette was mechanically secured in a film target distance of approximately 15 inches and at right angles to the central ray and as close to the left condyle area as possible. (Fig. 1.) Four roentgenograms were taken with the subject's head in the same position. The first was taken with the teeth closed (physical rest position), the second with the jaw opened 2 mm. (teeth approximately in physiologic rest), the third with a 10 mm. opening (incisal opening about 6 mm.) and the fourth with the jaw opened 15 mm. (incisal opening about 12 mm.). The proper amount of opening was obtained by the following procedure. An adjustable instrument, calibrated in millimeters and having bases in the vertical and horizontal planes, was designed to measure the amount and direction of movement of the chin point with respect to these planes as the jaw was opened. When the mandible was closed, the instrument was adjusted so that the horizontal base contacted the lower border of the jaw and the vertical base touched

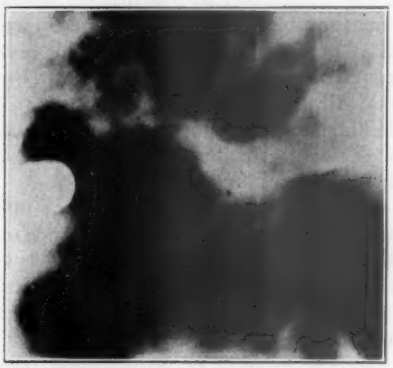

Fig. 2.—Position of condyle head with mandible closed. The teeth are at physical rest.

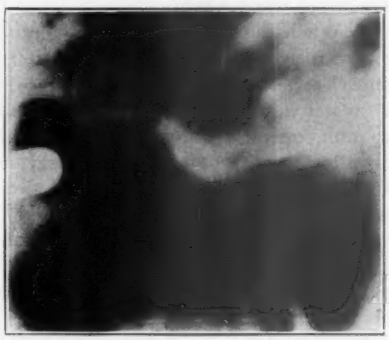

Fig. 3.—Condyle position with mandible dropped 2 mm. The teeth are approximately at physiologic rest.

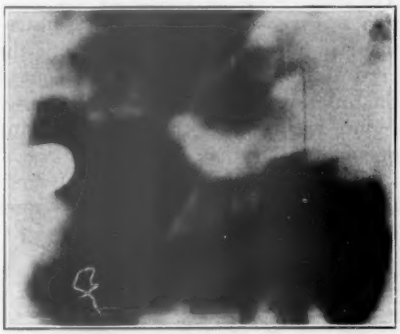

Fig. 4.—Condyle position with mandible droped 10 mm. The incisal opening is approximately 6 mm.

Fig. 5.—Condyle position with mandible dropped 15 mm. The incisal opening is approximately 12 mm.

the anterior portion of the chin. (Fig. 1.) This was the position for the first roentgenogram. The instrument was then adjusted by lowering the horizontal base 2 mm. and the patient was told to relax and "let the mouth drop open" until the jaw touched the horizontal base. This was practiced several times until it was felt that there was a true opening. The anteroposterior change in chin position was measured by sliding the instrument in the horizontal plane until the vertical base contacted the integument of the anterior of the chin. The same procedure was used for the 10 and 15 mm. openings.

The horizontal and vertical reference lines which appear in the roentgenograms

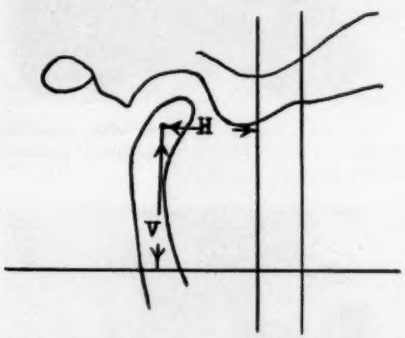

Fig. 6.—Diagram illustrating how horizontal (H) and vertical (V) measurements are taken; H, from dot in condyle head to vertical baseline; V, from dot to horizontal baseline.

(Figs. 2, 3, 4 and 5) and which are used for measurement of the condyle pictures as applied to this roentgenographic technic were procured by the method described by Speidel and Maxon.[8] The measurements were made directly on the roentgenograms. Before any measurements were made, the four roentgenograms were superimposed on one another to determine whether the reference lines and superstructures of the head remained in a constant relationship. If the constant relationship was not attained in a given series, other series of roentgenograms were obtained until this was accomplished. After this constant relationship was demonstrated, a dot was placed on the condyle of the roentgenogram in which the mandible was closed. By superimposing the condyle of the first roentgenogram on each of the succeeding ones, it was possible to transfer the dot to each condyle. In this manner, it was then possible to measure from the identical point in the condyle to the horizontal and vertical reference lines. (Fig. 6.) All measurements were made with a millimeter gage equipped with a vernier scale so that readings could be made in tenths of a millimeter.

Table 1 presents the frequency distribution of change in R (retrusion of the mandible) in each change of position of the jaw. Selected findings are:

1. A retrusive position of the mandible was demonstrated in all cases.

2. The amount of retrusiveness from physical to 2 mm. (approximately physiologic) was between 0.1 and 0.6 mm. The mean was 0.3 mm.

3. When the jaw was opened 10 mm., the retrusiveness varied from 0.1 to 1.6 mm. Sixty-two per cent of cases showed a greater amount of retrusiveness at this 10 mm. opening than any of the cases in the movement from physical to approximately physiologic. The mean amount of retrusiveness was 0.73 mm.

4. With 15 mm. of opening, the amount of retrusiveness varied from 0.3 to 2.2 mm. The mean here was 1.12 mm.

Table 2 shows the frequency distribution of change in vertical measurement of condyle position with change in the position of the jaw. Selected findings are:

1. For all cases, there was a decrease in the vertical measurements or a drop in the head of the condyle for the three positions studied.

2. In the case of the change from

physical to physiologic (2 mm. opening), the decrease or drop ranged between zero and 4 mm., the mean being 1.07 mm. Twenty-two of the fifty-eight cases (40 per cent) dropped 1 or more millimeters.

3. With a 10 mm. opening, the decrease ranged from zero to 9 mm. A decrease or drop greater than 4 mm. was shown in 65.4 per cent. The mean amount was 4.74 mm.

4. When the mandible was dropped 15 mm., the decrease varied from 1 to 14 mm. Only 6.8 per cent of cases showed a decrease less than 4 mm., whereas all the cases under the first condition showed a decrease smaller than this amount. The mean decrease or drop was 7.22 mm.

Table 3 shows the frequency distribution of change in horizontal measurement of the condyle position with change in the position of the jaw. Selected findings are:

TABLE 1.—RETRUSION OF MANDIBLE (CHIN POINT) WITH OPENING=R.

Increase in R Mm.	2 Mm. Opening		10 Mm. Opening		15 Mm. Opening	
	No. Cases	Per Cent	No. Cases	Per Cent	No. Cases	Per Cent
0.0 to 1.0	58	100	48	82.8	29	49.9
1.1 to 2.0			10	17.2	28	48.4
2.1 to 3.0					1	1.7
Mean Increase	0.30 mm.		0.73 mm.		1.12 mm.	
S. D.	0.14		0.33		0.42	

TABLE 2.—VERTICAL MEASUREMENT OF CONDYLE POSITION WITH MANDIBULAR OPENING

Decrease Mm.	2 Mm. Opening		10 Mm. Opening		15 Mm. Opening	
	No. Cases	Per Cent	No. Cases	Per Cent	No. Cases	Per Cent
0.0 to 1.0	35	60.3	1	1.7		
1.1 to 2.0	10	17.2	4	6.9	1	1.7
2.1 to 3.0	11	19.0	4	6.9	1	1.7
3.1 to 4.0	2	3.4	11	19.0	2	3.4
4.1 to 5.0			18	31.0	4	6.9
5.1 to 6.0			6	10.3	11	19.0
6.1 to 7.0			1	1.7	7	12.1
7.1 to 8.0			5	8.6	13	22.4
8.1 to 9.0			8	13.8	9	15.5
9.1 to 10.0					4	6.9
10.1 to 11.0					1	1.7
11.1 to 12.0					2	3.4
12.1 to 13.0					2	3.4
13.1 to 14.0					1	1.7
Mean decrease	1.07 mm.		4.74 mm.		7.22 mm.	
S. D.	0.92		2.08		2.36	

1. The change in horizontal measurement under condition one (2 mm. opening, or approximately physiologic) varied from a decrease of 4 mm. (the condyle moving forward) to an increase of 2 mm. (the condyle moving distally). The majority of cases (70.6 per cent), how-

ever, showed a forward shift of the head of the condyle. The mean amount of shift was a decrease or forward movement of 0.49 mm.

2. With an opening of 10 mm., the change ranged from a decrease of 11 mm. to an increase of 2 mm. In this position, only 5 per cent of the fifty-eight cases showed a distal shift of the condyle. The mean amount of change was a decrease or forward movement of 2.88 mm.

3. When opened to 15 mm., the change ranged from zero to 14 mm. No case showed a distal shift of the head of the condyle. The mean forward shift was 5.16 mm.

3. The majority of cases (70.6 per cent) showed a forward shift of the head of the condyle from physical rest to approximately physiologic rest. With an opening of 10 mm., 95 per cent of the cases showed a forward shift of the head of the condyle. When the mandible was opened 15 mm., all the cases showed a forward shift of the head of the condyle. All of the cases but one showing a distal movement of the head of the condyle presented some tooth interference, which may have caused the assuming of a convenience bite (forward position of the mandible, and therefore condyles) in the physical rest position. This may explain the distal shift of the head of the condyles in the first phases of opening.

4. Although the incisal opening never exceeded 12 mm. (approximately one-half inch), with this opening 100 per cent of the cases showed both a vertical and a horizontal shift of the head of the condyle and, in many cases, the condyle head had moved to a position below the eminentia articularis.

TABLE 3.—HORIZONTAL MEASUREMENT OF CONDYLE POSITION WITH MANDIBULAR OPENING

Change in Mm. + = Increase − = Decrease	2 Mm. Opening		10 Mm. Opening		15 Mm. Opening	
	No. Cases	Per Cent	No. Cases	Per Cent	No. Cases	Per Cent
+ 1.1 to + 2.0	1	1.7	1	1.7		
0.0 to + 1.0	16	27.6	2	3.4		
0.0 to − 1.0	31	53.4	11	19.0	4	6.9
− 1.1 to − 2.0	6	10.3	17	29.3	8	13.8
− 2.1 to − 3.0	3	5.2	4	6.9	8	13.8
− 3.1 to − 4.0	1	1.7	5	8.6	5	8.6
− 4.1 to − 5.0			7	12.1	8	13.8
− 5.1 to − 6.0			6	10.3	6	10.3
− 6.1 to − 7.0			1	1.7	3	5.2
− 7.1 to − 8.0			1	1.7	2	3.4
− 8.1 to − 9.0					5	8.6
− 9.1 to −10.0					3	5.2
−10.1 to −11.0			3	5.2	4	6.9
−11.1 to −12.0					1	1.7
−12.1 to −13.0						
−13.1 to −14.0					1	1.7
Mean Decrease	−0.49 mm.		−2.88 mm.		−5.16 mm.	
S. D.	0.94		2.70		3.27	

CONCLUSIONS

1. In all cases studied, as the mandible dropped from physical rest to an opening of 15 mm., there was a retrusive movement of the chin point.

2. In all cases, the head of the condyle dropped progressively from physical rest to the opening of 15 mm.

BIBLIOGRAPHY

1. PRENTISS, H. J.: Mandibular Articulation in Human Type. *D. Cosmos,* 60:505, June 1918.

Idem: Regional Anatomy, Emphasizing Mandibular Movements with Specific Reference to Full Denture Construction. J.A.D.A., 15:1085, December 1923.

2. LORD, F. P.: Movements of Jaw and How They Are Effected. *Internat. J. Orthodontia,* 23:557, June 1937.

3. BRODIE, A. G.: Temporo-Mandibular Joint. *Illinois D. J.,* 8:2-12, January 1939.

4. CHISSIN, CHAIN: Ueber die Offnungsbewegung des Unterkiefers und die Beteiligung der ausseren pterygoidmuskeln bei derselben. *Arch. f. Anat. u. Entwickelungsgesch.,* 1906.

5. TODD, T. W.: Facial Growth and Mandibular Adjustment. *Internat. J. Orthodontia,* 16:1261, December 1930.

6. HILDEBRAND, G. Y.: Studies in Masticatory Movements of Human Lower Jaw. *Scandinav. Arch. f. Physiol.,* Suppl. 61, 1931.

7. HIGLEY, L. B.: New and Scientific Method of Producing Temporo-Mandibular Radiograms. *Internat. J. Orthodontia,* 22:983, October 1936.

8. SPEIDEL, T. D., and MAXON, A. S. Reliability of Method of Orienting Subjects for Temporo-Mandibular Roentgenograms. *Am. J. Orthodontics,* 25:250, March 1939.

MEDICODENTAL RELATIONSHIPS IN DENTAL EDUCATION

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THE first concern of professional education is the methods by which practitioners can best be fitted to perform certain specialized tasks in the service of society. There are other important considerations in any program of professional education, but these are secondary to the fundamental purpose of specific utility that brought the professions into being, that gradually determined their quality of service and that ultimately established statutory protection of the people and of the professions through legal sanction of standards in education and practice. Therefore, it may be concluded that professional education is essentially vocational and that its objectives are primarily utilitarian.

This interpretation of the purpose of professional education does not deny the validity of the cultural attributes characteristic of the subject matter included in the various curricula, nor does it dispute the concomitant factor of university discipline resulting from the pursuit of knowledge in the special field. But the cultural factors in professional education are supplemental to specific objectives and may be promoted only by carefully planned procedures that place suitable emphasis upon them without any violation of the main purpose of the educational program.

The evolution of dental and medical education faithfully supports this conclusion. The advent of the primitive healing arts was a response to the urgent need among members of society for effective care of human ills. The vocations of medicine and dentistry became firmly established in the esteem of society as utilitarian institutions, and they grew and increased in usefulness under the benevolent patronage and protection of a society which they were designed to serve.

Read before the American Association of Dental Schools, St. Louis, Mo., March 18, 1941.

Empiric practices long preceded the scientific investigation of the nature of the problems with which medicine and dentistry were concerned; and the preceptorial method of education, employed in transmitting their empiric bodies of knowledge from one generation to the next, long antedated formal institutions of learning. The body of scientific knowledge that emerged was enlarged when the questioning minds of a more enlightened civilization put all knowledge to a test; and schools for the perpetuation of this body of scientific knowledge were organized when practitioners perceived that the principles underlying the body of accumulated knowledge could be reduced to orderly form and could be acquired by the student with greater profit and facility than the ordinary conditions of apprenticeship had permitted. Under the preceptorial system of education, the student learned from the experience of others and, by repetition of certain procedures, acquired an empiric art of practice. Under the systematic planning of formal education, a scientific body of knowledge was organized and administered in a manner designed to develop in the student a scientific attitude and a self-reliance that would insure a rational art of practice. In both the empiric and the rational stages of medical and dental education, a body of knowledge served as the base upon which the medical and the dental arts of practice were superimposed.

In considering the balance that should exist in the dental curriculum and the relationship that the basic sciences should bear to clinical instruction, it is important to observe that science and art have not always been joined securely in the programs of medical and dental education. From the time of Hippocrates, the study of the basic sciences was limited mainly to philosophic considerations and was viewed largely as an academic problem. Scholars who devoted their time to the basic sciences prided themselves on their investigation of truth for truth's sake, and held themselves scrupulously aloof from participation in the practical uses to which their discoveries might be put. For centuries, these sciences were considered an important area of philosophic study and were regarded of value only as a university discipline. On the other hand, the physician's art was taught from the practical point of view by guilds of physicians and surgeons, without formal correlation with the enlarging basic sciences. This condition was a clearly defined example of the conflict between the cultural and utilitarian concepts, which occupies an important place in the history of education. It was not until the eighteenth century that study of the basic sciences was united with demonstration methods of clinical instruction to establish a balanced program of medical education.

The basic sciences that serve as a foundation for medical education serve also in a general and in a special sense as the base for dental education. However, as in medicine, the relation between dental science and dental art was not recognized for centuries. It is of particular importance to our discussion to observe that the growth of dental art was not only independent of the growth of basic sciences, but also distinctly independent of the physician's art. Dentistry continued for many centuries entirely in the hands of a group known as "dentators," who were independent of the so-called "doctors." The reason why there was a separate growth of medicine and dentistry was the practical difficulties involved in combining their arts of practice. The highly specialized procedures that constitute the art of dental practice are so extensive and so technical that, from the beginning, they have formed a major branch of health service; while the performance of these operations has

required a high degree of digital skill, the cultivation of which has always been recognized as beyond the scope of medical education. The body of scientific knowledge of special interest to dental art that began to develop in ancient Greece gradually grew in importance and scope until it was finally brought into practical relation with the art of dental practice in the opening years of the eighteenth century, to produce what has since become known as scientific dentistry.

An important relationship between medicine and dentistry exists in the fact that dentistry as an important division of health service "has its roots in the same biological soil as medicine." The basic sciences that serve as the resources of medicine serve also as the resources of dentistry. These basic sciences are frequently referred to as medical sciences because they are recognized as a vital part of medical education; but their use is not restricted to a particular field and they may be adjusted or modified to suit any special needs that sound educational purposes suggest. They are medical subjects not in the possessive sense, but in the utility sense. Any use of them designed to serve the health purposes of medicine and dentistry will be concerned not so much with the juxtaposition of the basic science courses in their curricula as with the quality and the integrity which such courses contribute to the specific purposes of the plans of education. There seems to be no valid reason why the basic sciences should be identical in scope or content in the two curricula; but there is reason why they should be qualitatively equal and fully adequate to the educational purposes of the plans of education which they are meant to serve. This assumption does not suggest substandard courses for either medicine or dentistry; but it does recognize the necessity for the distribution of emphasis upon particular phases of the various subjects by the respective professions, an emphasis that may be established without injury to academic values or scientific importance.

The scope and content of the basic science subjects in the dental curriculum are not and have never been equivalent to the requirements in medicine. The reason for establishing lesser dental requirements was the belief among early educators, encouraged by concurrent medical opinion, that the dental art, encompassing in its practice but a small area of the human body, does not require a detailed mastery of the basic sciences as does medicine, the practice of which involves in its scope the entire human body. Institutional dental education was projected on the assumption that the scope and content of the basic sciences should be general in character, but should emphasize those divisions of the subject of special use to the dental art. The fact that medical and dental requirements differ may indicate a fault in one or the other, or in both philosophies. But it would seem that no judgment should be passed on any existing disparity between the two until the reason for such differences is understood. Changes in the scope and content of the basic sciences in the dental curriculum should not be made to conform arbitrarily to the requirements in the medical curriculum: the fundamental needs of dental education and dental practice rather than the mere act of conformity should determine what the scope and content of the basic science courses in the dental curriculum shall be.

Any attempt to equalize quantitatively the content of the basic science courses included in the present plans of medical and dental education should be based upon a careful study of the current requirements of the two curricula to determine how nearly they resemble each other, how much they differ and in what respects, if any, they are identical. In addition, any serious study of the

competency of the dental curriculum should observe and give suitable weight to the final conclusions of the Curriculum Survey Committee in its report to the American Association of Dental Schools.[1] The opinions of competent educators drawn from an exhaustive study of the requirements necessary to achieve the objectives of dental education should not be discarded in favor of arbitrary opinions expressed by those who lack the essential qualifications to judge the merits of dental education.

Prompted by a desire to make changes in the preclinical instruction in the dental school of the University of Maryland, we have attempted a survey of the medical and dental curricula, including in our study only those medical schools in universities in which dental schools are also present. The survey was made not by the use of a questionnaire, but by a study of the catalogs of the schools in question. The result was revealing to us, and I think will be of interest to you. The accompanying table shows the results of our study and reveals the wide variation in the basic science requirements in medical schools, and in dental schools, and also the variations between the medical and the dental curriculum.

An examination of the requirements of the basic science courses included in the medical curriculum shows extreme variation between the minimum and maximum clock hours scheduled in the thirty-four medical schools studied. In gross anatomy, for example, the lowest number of clock hours required in any one of the medical schools is 280. The maximum number of clock hours in any one school is 546. Further variations from the minimum to the maximum are illustrated by the requirements in the following medical schools: Harvard, 280; Michigan, 303; Maryland, 350; Pennsylvania, 436; Southern California, 500, and Georgetown, 546 hours. A check of a number of medical schools in universities in which dental schools do not exist confirmed the significance of this observation. Of five schools not associated with dental schools, Rochester requires 300; Johns Hopkins, 350; Yale, 384; Stanford, 423, and the Junior Medical School, Dartmouth, 600 hours. The evident lack of unity of opinion among medical educators as to what constitutes a standard quantitative requirement in gross anatomy is characteristic of all preclinical subjects in the medical curriculum. It presents an enigma to dentistry when it is called upon to conform to what are loosely designated as "medical requirements."

The table serves to present comparisons between the two curricula that may be used in forming general conclusions.

BASIC SCIENCE REQUIREMENTS IN MEDICAL SCHOOLS

	Medicine			Dentistry			Curriculum Survey Proposal
	Min.	Max.	Av.	Min.	Max.	Av.	
Gross anatomy	280	546	379	128	377	273	256
Histology	168	298	225	112	274	194	192
Biochemistry	110	300	213	88	338	141	128
Physiology	160	296	229	96	287	161	160
Bacteriology	132	322	184	66	198	118	96
Pathology	236	451	353	160	400	217	192
Pharmacology	99	221	164	48	192	95	80
Totals	1,185	2,434	1,747	698	2,066	1,199	1,104

Points of equality in the curricula are observed in the aggregate minimum of hours in medicine and the aggregate average of hours in dentistry, between which there is a difference of only fourteen clock hours. The aggregate maximum of hours in dentistry exceeds the aggregate average of hours in medicine by 319 hours. The aggregate minimum of 698 hours in dentistry is entirely too low to serve adequately the needs of later clinical instruction, and the aggregate maximum of 2,434 hours in medicine would seem to be beyond the capacity of any medical school. Since the aggregate maximum of hours in the medical curriculum is excessive, it would appear that the curriculum deserves study and suitable adjustments in the interest of its fundamental objectives. Equivalence, if desirable, might be achieved by establishing the aggregate average of hours in the present curriculum as dentistry's minimum, since it is approximately the same as the aggregate minimum of hours in medicine. Also, it is approximately the same as the standard recommended by the Curriculum Survey Committee. Such a plan would apportion to the basic sciences 1,199 hours, or 27 per cent of the 4,400 hours suggested as the maximum for the dental curriculum.

There is nothing in our study to indicate that medicine regards it necessary to prescribe quantitative requirements in the preclinical courses, but there are indications that medicine is satisfied to proceed on the premise that each medical school understands its own problems and that each school should be left free to establish its own standards. This freedom of choice has made it possible for strong, aggressive, enthusiastic teachers of certain subjects to secure preferential time allotment for their subjects, the effect of which is to unbalance a curriculum that should be considered from the standpoint of a whole rather than an assemblage of unrelated parts. Until there is some semblance of uniformity in the basic science requirements in the medical curriculum, if such uniformity be either desirable or possible, medical leadership can be of little assistance to dental educators in their efforts to establish quantitative basic science requirements; and medical requirements must be more rationally defined and organized if dental education can hope for guidance from that source in establishing specific provisions for preclinical science instruction.

Considered purely from the viewpoint of utility, an appraisal of the quantitative basic science requirement in the dental schools of the country, as revealed in minimum requirements found in dental school curricula, leads irresistibly to the conclusion that expansion of these courses is necessary in a number of dental schools. Other desirable modifications of the dental curriculum would probably take the direction of an extension of the time currently allotted to various subjects in order to take up a lag that has developed during the past quarter of a century and to provide for courses imposed by the new knowledge that has created a necessity for adding new subjects and subdividing old ones. Our study of the dental curricula suggests that, for purely utilitarian purposes, the scientific foundation of the dental student should be enlarged.

A second important relationship in undergraduate dental and medical education is to be found in the joint responsibilities of the medical and the dental professions in their services to the patient. The need for an effective cooperative relationship between the arts of dental and medical practices was for a long time obscured, though a connection between oral and general disease was early detected by discerning dentists—in fact, such a connection was pointed out by an American dentist as early as 1776, but the theory did not find sympathy in the medical profession until about thirty

years ago. Today, both professions recognize that the menace of oral disease to general health is so imminent and the part oral sepsis plays in the dissemination of infectious diseases is so profound that the need for coordination of effort in treatment and prevention requires that a cooperative understanding between the two be rooted in both the medical and the dental curricula.

The fact that medicine and dentistry rest on a common foundation and that they are complements in producing a well-rounded health service suggests the desirability of a closer relationship in the details of both medical and dental education to provide for a more effective coordination of effort in clinical instruction and in practice. Many physicians carefully plan their diagnosis and treatment to include the cooperative services of the dentist; but the large majority ignore the dentist and elect to proceed in diagnosis and treatment on the assumption that the dental aspects of the health problem are of little consequence. This indifference shown by physicians is directly traceable to the failure of the medical curriculum to place suitable emphasis upon the importance of oral health to general health. Nothing is more needed in medical education than instruction which would give the medical student an intelligent understanding of the part that the dentist should play in assisting the physician in many of his problems. Speaking on this point, Sydney R. Miller said: "The Professor of Medicine at one of these institutions [University of Maryland; Johns Hopkins] admits without reservation that more concerning the teeth should be given to the average medical student, and that some of it, at least, should come from the dentist."[2] Unless medical education meets its admitted responsibilities and provides instruction that will prepare the physician to cooperate with the dentist, any attempt to strengthen their relationship will be defeated by the lack of medical understanding and appreciation.

The utility of prerequisite basic science courses as they may be applied in clinical instruction and the competency of the dental student will be determined by the understanding of basic principles that the student demonstrates in clinical study and the facility with which he comprehends the significance of the practical problems that confront him. An intimate knowledge of the structures of the parts, the functioning of the parts involved in metastatic phenomena and the nature of disease contributes various weights to the educative processes employed in equipping the student to participate in the prevention and cure of disease. A competent knowledge of general pathology and an intimate knowledge of oral pathology that establish a clear understanding of the relationships between oral sepsis and general disease are necessary not only to the dentist, but also to the physician. The dental curriculum, as now organized, makes ample provision for adequate instruction in the general aspects of the basic science courses and provides for special emphasis on a study of the structures, functions and diseases of the oral cavity and adjacent parts. The scope and the character of instruction equip the dental student to cooperate intelligently with the physician in the diagnosis and treatment of disease and to employ effectively principles of prevention in oral medicine. It would seem that in order to create a more effective medicodental relationship, the simple act of cordiality in cooperative endeavor is needed more than any specific changes in the dental curriculum or in its administration.

The purpose of instruction in clinical oral pathology is to cultivate in the student an understanding of the manifestations of disease, to enable him to determine its etiology and to equip him to

prescribe suitable treatment. Clinical exercises are designed to familiarize him with the technical procedures employed in a competent oral examination, to develop in him a mastery of all modern aids in arriving at an accurate oral diagnosis, and to acquaint him with the essential technics employed by the physician in a thorough physical examination. It is through an intimate knowledge of scientific method and an ability to determine the nature and significance of oral disease that the dentist is prepared to serve effectively in consultation with the physician.

If there is a particular weakness in the coordination of effort by dentist and physician, it lies not so much in the differences in scope and content of the basic science courses as in failure to link the clinical activities of medical and dental students. Greater opportunities should be provided the dental student to work with the medical student, to observe at the bedside the symptoms and manifestations of general disease. If he is to render an effective health service, it is imperative that he be made acquainted with hospital routine and hospital procedures through free access to and participation in the advantages that hospital and dispensary have to offer. The unwarranted disdain so often shown by the physician for the efforts of the dentist should, if possible, be removed from the picture as unjust to the dentist and unworthy of the physician. The obvious need for more effective medicodental cooperation in the interest of the patient has placed equally upon dental education and medical education the responsibility for readjustments in programs and procedures to meet the apparent mutual responsibilities of physician and dentist. This situation does not call for drastic changes in the dental curriculum, nor does it demand identical scholastic experiences for both medical and dental students. But it does call loudly for thoroughness in preparation for service, and the development of cordial attitudes that will consider the entire health of the patient as of the greatest ultimate importance in any program of medical and dental education.

This conception of a practical medicodental relationship is based on a confidence in the self-determining character of dental education and of dental practice. It implies a firm belief in the integrity, the sufficiency and the efficacy of the present plan of dental education. It inferentially contradicts the theory that dentistry can be made an integral part of medical education without serious injury to the basic purposes of dentistry. It does not argue that the current dental curriculum is perfect, that dental teaching is entirely satisfactory or that other responsibilities of dental education have been completely satisfied. It does insist that, for the present, dental education is meeting competently its many problems and that it is capable of effecting any modification of its program that may be necessary to bring dentistry to the stature of a full equivalent of a specialty of medicine.

The opinion has been expressed from time to time that an effective medicodental relationship can be established only through the integration of dental education with medical education. Those who have sponsored plans for submerging dental teaching in the program of medical education seem to have lacked understanding of the true meaning of the problems which they have presumed to direct. They have seemed to think that in developing permanent institutions, they may subordinate principles to forms instead of adapting forms to principles. They have proceeded on the assumption that no matter what changes may be made in the basic substance of dental education, the fundamental purposes of dental education will continue to be served. In all instances, they have

overlooked the fact that when the nature of a substance is changed, its characteristics are altered, its peculiar properties are destroyed and its prior uses are caused to disappear.

Instances of recurrent efforts by enthusiasts to effect a merger of dental and medical education are scattered through dental history. The first serious attempt in this direction was made in 1850 by a group of dentists who attempted to establish dental departments in colleges of medicine in the belief that such ventures would succeed and would force the abandonment of independent dental schools. In the discussion of the proposal, Chapin A. Harris stated:

> When the first dental college was about going into operation, we were waited on by three members of the faculty of one of our oldest and most respectable medical schools, and tendered such a professorship as is suggested by Dr. Gardette, but we declined it upon the ground that no purely medical institution could afford the necessary facilities for thorough practical instruction in operative and mechanical dentistry, and that, consequently, if we accepted it, we would be employed in making the worst kind of quacks—men without skill but with acknowledged pretentions to it.[3]

This statement by Harris terminated the discussion, and interest in the venture soon abated; but the idea has persisted, and other occasional efforts have been made to crystallize sentiment in favor of control by medical education of dental education. An important instance of this kind occurred in 1932 when seven members of the Committee on the Costs of Medical Care introduced into the report the suggestion that trends were in the direction of combining medical and dental education, in some unexplained fashion, to produce a dentist "who is also a physician":

> We recommend the growing tendency in the practice of dentistry toward a division of labor in which a dentist who is also a physician assumes larger responsibilities for the diagnosis and treatment of conditions arising from or related to the teeth, while much of the routine performed by the dentist in the past is delegated to dental hygienists and other technicians working under his direction.[4]

The purpose of this statement was to create the impression that interest in the present plan of dental education was waning and that the medicodental aspects of dentistry were gravitating toward a new type of dentist "who is also a physician." The highly doubtful character of this statement was so obvious that the officers of the American Association of Dental Schools challenged it, calling upon the signers of the statement to give evidence of the existence of any such tendency as described. In responding, the signers dealt in generalities or expressed prejudices hardly to be expected from members of that committee; or, like Dr. Owre, explained that the growing tendency was not apparent in America, but did exist in Europe:

> It is unfortunate, perhaps, that this footnote did not indicate that the statement did not relate specifically or exclusively to conditions in this country. On the other hand, in view of the well-known European movements, it would seem that this probability would have been taken into consideration by impartial critics.[5]

This furtive attempt to indict the existing plan of dental education in America failed to attract any supporters or to inspire any enthusiasm for the drastic readjustments that would be necessary to deliver the education of the dentist to medical education. It was only another abortive effort to substitute theories for tested realities.

Today, we are viewing a recurrence in concrete form of the theory that dental education will thrive better under the sponsorship of medical education. Dental education, in a broad sense, is confronted with a definite program at Harvard University, designed, so it is argued, to establish a more effective medicodental

relationship. We are told that the purpose of the plan is to be achieved by combining the dental curriculum with the medical curriculum in such a manner that the student will be concurrently a candidate for the M.D. and D.M.D. degrees, both of which he may receive at the end of an undergraduate professional course of five years.

In commenting on the "Harvard Plan," I do not wish to be understood as challenging the privilege of any educational institution to inaugurate in its plan of education any changes, rational or speculative, that it may desire. I do contend, however, that drastic changes in any one of the dental schools, in which similarity of program must exist, are liable to be far-reaching and tend to influence every participating element in the educational system. In the circumstances, such changes lose their local significance and assume a rank of universal importance. It is because of the intimate connection between the Harvard Dental School and all other members of this association that we are justified in commenting on the new plan of dental education inaugurated there.

Recently, C. Sidney Burwell, dean of the Harvard Medical School, described the newly devised Harvard School of Dental Medicine as an experiment: "It seems to me that this experiment (which is what it is) is not only an experiment in dental education, but also an experiment in the general problems of education for special forms of practice."[6]

No fair judgment will question the earnest effort of educational institutions, or other responsible agencies, to investigate the unknown, or, if it seems desirable, to test the current competency of any long-established practice; but the same fair judgment would demand that such trial accord with the usually accepted procedures in experiment.

As we view it, the Harvard Plan reveals none of the essential characteristics of experiment. It does not state a hypothesis: it announces a conclusion. It is not a tentative arrangement that may be continued or abandoned without injury, but an avowed permanent pattern that arbitrarily establishes a compromise program that unites medical art and dental art at the expense of the essential qualities of each. It is not an experiment in the sense that it is designed to test the validity of the existing concepts of dental education. It is a plan that substitutes an arbitrary, untried pattern in dental education for a workable device that has justified its one hundred years' service to society. It does not demonstrate the speculative feature of experiment, that hopes for much and promises nothing; but gives unqualified assurance of success in the program as it relates to acceptable qualifications of its graduates to practice medicine, to practice dentistry, to serve as specialists in dentistry, to participate in public health activities, to engage in teaching and to pursue research.

It would appear that the Harvard Plan must overcome some serious difficulties if it is to be of any genuine value to dental science or dental art. Among its disturbing features is the proposal to extend the tenure of study beyond reasonable requirements for undergraduate plans in education. It is based on the practical admission requirements of three years' preprofessional education, to be followed by five years in the professional curriculum. During the past twenty-five years, dental education has, on three different occasions, advanced its academic requirements. The resulting reduced enrollments below the safety point of public demand would warrant the conclusion that economic factors as they relate to both time and expense would be dangerous deterrents to enrollment under the plan.

The promise that the plan may be depended on to provide other schools of dentistry with teachers and researchers and the public with specialists and health workers is not alluring. It must be re-

membered that training under the plan is in the undergraduate field; that the first two years, as formerly, will be devoted to the basic science courses, and that three years can hardly be regarded as sufficient for teaching both the art of dentistry and the art of medicine in a manner competent to validate both degrees. In fact, the dental specialties, oral surgery and orthodontia, are even now in the graduate field in dental education, and there is grave doubt that their purposes can be satisfied by the mechanism of the Harvard Plan. The plan involves handicaps imposed by curriculum stresses detrimental to the development of scientific qualifications of the graduates for the successful pursuit of research and to the development of acceptable skill in the profession of teaching. Education both for teaching and for research is properly the function of the graduate school. The time is past when the medical or the dental degree, no matter what its source, may be accepted as a sufficient qualification for men to serve as science teachers, and only rarely will the scholastic requirements for either of these degrees produce a competent researcher. Individuals with either degree may engage in research or serve as clinical teachers, but, even in clinical instruction, graduate training is of great benefit to the teacher.

The logical conclusions are that the Harvard Plan of dental education cannot qualify as an experiment; that the value of its direct service to the public in providing dental practitioners is in grave doubt because of economic restraints inherent in the plan; that its possibilities for contributing to the scientific advancement in dental teaching and dental research are hopelessly involved in the complications that must exist in the effort to combine the teaching of the arts of medicine and dentistry in order to qualify the graduate to practice either. Every effort that has been made in the past to adapt the education of the dentist to the pattern of the education of the physician has led inexorably to the extinction of interest in dentistry. There is nothing to justify the belief that the Harvard Plan will be an exception.

Dental educators would welcome any change that might offer to improve dentistry's services to society through a more effective medicodental relationship. Logic and experience convincingly support the conclusion that such improvements cannot come from a combination of dental and medical education in the same plan; but there is reason to conclude that they can come through proper encouragement and adequate financial support of dental education by the university. It is safe to predict that an effective medicodental relationship can be established through reasonable and practical readjustments in both medical and dental plans of education if careful attention is given to the utility and serviceability of the respective curricula, and if endowments and appropriations, now so badly needed, are secured and concentrated on the development of adequate facilities to make more effective the present plan of dental education.

BIBLIOGRAPHY

1. A Course of Study in Dentistry. Report of the Curriculum Survey Committee, American Association of Dental Schools, 1935.

2. MILLER, S. R.: Some Problems of Mutual Interest to Dentists and Physicians. *J. Am. Coll. Dentists*, 3:14, March-June 1936.

3. *Am. J. D. Sc.*, New Series, 2:399, April 1851.

4. Medical Care for the American People, Chicago: University of Chicago Press, 1932, pp. 112-113.

5. Personal communication to the author, then president of the American Association of Dental Schools.

6. *J. D. Education*, 5:182, February 1941.

USE OF SULFANILAMIDE IN ORAL SURGERY

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SULFANILAMIDE has been used locally and systemically in the prevention and treatment of infections of the oral cavity and tooth sockets.

PROPHYLACTIC USE

Sinclair[1] was the first to report that the local use of sulfanilamide in tooth sockets or wounds from the extraction of teeth was beneficial. Lanier[2] placed the drug in the tooth sockets of patients whose teeth had been extracted because of advanced pyorrhea or chronic periapical infection. In all of these patients, "there was marked decrease in the usual after-extraction soreness, no pain and no dry sockets."

On the basis of these reports and others, many oral surgeons now use sulfanilamide routinely as a preventive of "dry socket" and infections following extractions. But the value of the universal prophylactic use of sulfanilamide is not established. The site and nature of the lesion should be considered. The type of the possible infecting organism is important; for while sulfanilamide is effective against hemolytic streptococci, it has little effect on streptococci of the non-hemolytic or viridans variety and on many of the other organisms commonly found in the mouth. Finally, if prophylaxis is to be carried out, there is the question as to whether the drug should be used systemically or locally.

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SYSTEMIC PROPHYLACTIC USE

Should every patient who has had an extraction be given moderate doses of sulfanilamide by mouth in order to check bacterial growth in the wound from the onset? There is little information as to the value of the method. It has been tried extensively only for the prevention of puerperal fever, and with inconclusive results. Although the possible advantages are clear, there are also practical and theoretical disadvantages.

The administration of sulfanilamide prophylactically would be superfluous in most instances, since most extraction wounds heal without difficulty. Then there is the ever-present possibility of toxic reactions to the drug. These may not necessarily be severe, but are nearly always annoying to the patient. There is also at least the theoretical danger of selectively breeding from the original wound flora those bacteria that are most resistant to sulfanilamide. Infections so arising would be resistive to treatment, whereas, if use of the drug were withheld until signs of infection appeared, the nature of the infection would be determined by other and natural conditions and the bacteria concerned might often be very susceptible. Finally, sulfanilamide given to dogs in doses comparable to the doses used by human beings has been shown to have an inhibiting effect on the healing of uninfected incised wounds.[3] In my opinion, these disadvantages are serious enough to rule against the systemic prophylactic use of sulfanilamide.

LOCAL PROPHYLACTIC USE

The favorable reports of certain oral

surgeons have been mentioned. In another field, that of war wounds, the local use of the drug appears to have reduced the incidence of infections.[4] Certainly, a concentration of the drug can be obtained locally which could not possibly be safely maintained by systemic administration. Finally, the procedure is simple, and because of the small amount of the drug that is absorbed, the chance of a toxic reaction is very slight. The disadvantages of the method are the same as those listed under systemic prophylactic use, with the important exception that the possibility of a toxic reaction is remote.

It is difficult to evaluate these advantages and disadvantages in the case of the local prophylactic use of the drug. I doubt whether the procedure is universally indicated. Further controlled trial should be made in those instances in which the chance of infection seems greater than usual.

TREATMENT OF INFECTIONS

The treatment of infections already developed should be systemic. Because of the possibility of toxic reactions, I believe the drug should be administered only in consultation with a physician. It is imperative that treatment be started as early as possible. If there is clinical evidence that an infection is due to hemolytic streptococci, sulfanilamide is given without awaiting the results of bacteriologic investigation.

ADMINISTRATION; DOSAGE

Sulfanilamide is usually well tolerated by mouth, and this is the most desirable method of administration in the vast majority of instances. The drug can be given by stomach tube in unconscious and uncooperative patients. The dosage varies considerably and rules of dosage and blood levels are only general guides. Most cases require individual attention.

In severe infections, a concentration of from 10 to 15 mg. of sulfanilamide per hundred cubic centimeters of blood is ordinarily required. To establish this concentration quickly, one usually gives in adults an initial dose of 4 gm. (60 grains) and then 1 gm. (15 grains) every four hours. In mild or moderately severe infections, a concentration of from 5 to 10 mg. per hundred cubic centimeters of blood is satisfactory. This level is usually reached by giving from one-half to two-thirds the amount recommended for severe infections.

The concentration of the drug in the blood should be checked periodically.

GENERAL CONSIDERATIONS IN TREATMENT

The use of sulfanilamide does not necessitate a special diet. The fluid intake should be between 3,000 and 3,500 cc. per day. Most physicians administer sodium bicarbonate grain for grain with sulfanilamide in order to combat possible acidosis. Saline cathartics are avoided on the premise that the sulfate radicle may predispose the patient to sulfhemoglobinemia. Otherwise, all of the more commonly used drugs can be administered concurrently to patients receiving sulfanilamide.

Auxiliary treatment, such as blood transfusions to combat anemia or to supply immune bodies, incision and drainage of localized foci of pus and general supportive measures, should not be neglected.

WHEN TO DISCONTINUE CHEMOTHERAPY

Provided there are no serious toxic reactions, the drug should be continued in full dosage until definite improvement has occurred and the temperature is normal. Then the dosage can be reduced, and, in a few more days, use of the drug can frequently be discontinued. In infections of moderate severity, the dosage may be cut in half when the temperature drops to normal and the use of the drug can be discontinued shortly thereafter.

SYMPTOMS OF MILD TOXICITY

Symptoms of mild toxicity, such as malaise, lassitude, weakness, headache, dizziness, depression, anorexia and nausea, are frequently encountered in patients receiving sulfanilamide. Less commonly, tinnitus, mental confusion, paresthesia, dyspnea, inability to concentrate, diarrhea, constipation and vomiting are observed. Lowering of the carbon dioxide combining power is not uncommon. With rare exceptions, the drug can be given despite these manifestations.

CYANOSIS

Some degree of cyanosis is present in 90 per cent of the cases in which the drug is used. It varies from a mild bluing of the lips or nail beds to an intense slatey discoloration of the entire body. It usually appears shortly after treatment is started. It may disappear during the course of treatment and uniformly disappears within a few days after use of the drug is stopped. Unless anemia is present, cyanosis is not a serious complication.

FEVER

Fever due to use of the drug occurs in about 10 per cent of cases in which sulfanilamide is used. It usually appears about seven days after use of the drug has been started, although it may occur at any time during the course of therapy. It is usually high and may be intermittent and accompanied by chills, presenting a clinical picture like that of septicemia. The fever subsides in from twenty-four to seventy-two hours after use of the drug has been discontinued.

Fever appearing in patients receiving sulfanilamide for a disease which is ordinarily afebrile should be regarded as a complication of the therapy until proved otherwise. It is a more difficult problem to recognize drug fever in patients suffering from a febrile disease. Under such circumstances, the fever can be ascribed to sulfanilamide if (1) the original disease has reached an afebrile stage and (2) the temperature returns to normal after use of the drug has been discontinued. Fever due to sulfanilamide therapy indicates that use of the drug should be stopped, particularly since fever, in many instances, is the first sign of other more serious complications.

CUTANEOUS LESIONS

Cutaneous lesions due to sulfanilamide have occurred in about 4 per cent of the patients receiving the drug. Most of these have been morbilliform, a lesser number scarlatiniform. They necessitate stopping the use of the drug.

OTHER SEQUELAE

Hemolytic anemia, granulocytopenia, toxic hepatitis and toxic psychosis are serious, but fortunately uncommon, sequelae of sulfanilamide therapy.

SUMMARY

Whether all patients who have had extractions should receive sulfanilamide prophylactically is doubtful. In those cases in which prophylaxis seems to be indicated, it should be local. Actual treatment should be systemic and should be carried out in consultation with a physician because of the possibility of toxic reactions.

The drug is administered by mouth in amounts sufficient to maintain a blood level of about 10 mg. per hundred cubic centimeters. Provided serious toxic reactions do not occur, use of the drug is continued until improvement is definite and the temperature has been approximately normal for two days. At this time, use of the drug frequently can be discontinued.

Symptoms of mild toxicity due to sulfanilamide therapy, such as malaise, lassitude, weakness, headache, dizziness, anorexia, nausea, slightly lowered carbon

dioxide combining power and slight to moderate cyanosis or dyspnea, need not cause concern.

Moderately severe symptoms of toxicity, such as deep cyanosis, marked dyspnea, distinctly lowered carbon dioxide combining power, severe vomiting, diarrhea, abdominal pain, itching of the skin and slowly developing anemia, call for vigilance and possibly a reduction of dosage.

Symptoms of severe toxicity, such as fever, dermatitis, acute hemolytic anemia, leukopenia, psychosis or jaundice, demand immediate discontinuance of use of the drug.

BIBLIOGRAPHY

1. SINCLAIR, J. A.: *J. Canad. D. A.*, 3: 571, November 1937.
SINCLAIR, J. A., and BARKER, O. C.: *Am. J. Orthodontics*, 24:266, March 1938.
SINCLAIR, J. A.: *D. Survey*, 14:935, August 1938.
2. LANIER, W. D.: *M. Bull. Vet. Admin.*, 15:21, July 1938.
3. BRICKER, E. M., and GRAHAM, E. A.: *J.A.M.A.*, 112:2593, June 24, 1939.
4. COLEBROOK, L.: *Lancet*, 2:113, July 27, 1940.

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PROSTHETIC DENTAL SERVICE FOR THE ARMY IN PEACE AND IN WAR

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SINCE the first World War period, many changes have altered the scope of dental service in the Army, both in the concept of its function and in the facilities for the accomplishment of its mission. These changes have come not only as a result of the great advancement of the dental profession, but also as a result of the recognition of dentistry as an essential health service. Accurate dental diagnosis as related to general health is of vital moment when related to the health of troops. Equally important is the provision of adequate facilities and ample trained personnel to meet the demands for this service at every Army station in the United States and in our foreign possessions.

During the last World War, many here present were in the Army, and your recollections of the attempts made to establish a satisfying denture service are not exactly pleasant ones. Adequate equipment, trained personnel and the facilities required for desirable results were seldom available. After that period, it took several years to acquire a desirable plan, and many more years to make that plan effective. The Army had provided a small dental laboratory, containing the usual equipment for every station; but trained mechanics were at a premium, and the dental surgeon seldom found the necessary time to observe a laboratory routine. The whole scheme was unsatisfactory for exactly the same reason that the dentist in civil practice has found it so—it is impossible, without efficient laboratory assistance, to render high class denture service and also conduct a busy general practice.

Furthermore, since Army regulations place the responsibility for dental health squarely upon the shoulders of the Dental Corps, it is essential that an adequate plan be provided for denture service in the Army. Since a large majority of en-

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listed men are not possessed of healthy mouths, it can be readily understood that denture service constitutes one of the major problems of military dentistry. There must be a sound plan and an earnest effort to meet this demand.

Dental service is established in every military hospital and dispensary in the Army. While, in many hospitals, it is a large and elaborate service, in a majority of cases it is small, serving a few hundred troops. To assure a satisfactory laboratory service meeting the needs of all our dental clinics, a number of large laboratories have been created, suitably located throughout the country, to best serve the dental clinics in their particular areas. It was evident that a few of the larger Army posts and all general hospitals would require large dental laboratories as part of their local dental facilities because their needs would be excessive. We, therefore, have established five large dental laboratories in the United States, in addition to expanding the facilities at two of the larger Army posts, at all general hospitals and in Panama and Hawaii.

In the execution of this plan, two serious problems confronted the Dental Corps; namely, administration of the laboratories and the procurement of trained personnel. It was determined that dental officers with special training would be in charge of all laboratories, and that these officers would completely control and dominate the laboratory service. This meant cooperation between the dental clinics and the laboratories, and complete control of the laboratories and the technicians. In other words, there is a continual flow of cases—models, bite-blocks, etc.—from the clinics to the laboratories. The dental officers in charge of the laboratories survey each case and their instructions in fabricating the replacements are carried out by the technicians. In no way are the technicians "in command" of the situation. Careful professional supervision and direction of the entire laboratory service assure us of the highest standards, and achievements beyond our fondest expectations have resulted.

Each clinic is provided with the finest equipment and supplies for the primary steps in modern denture service. Preparation of the mouth, study of the hard and soft tissues and essential steps are carefully and thoroughly accomplished, while the impression technic and other procedures are carried out in accordance with the most acceptable methods. Essential information concerning each case is forwarded to the laboratory, along with the models, bite-blocks, etc.

In a large organization like the Dental Corps, it is essential that special provisions be made to secure competent dental technicians for this extensive laboratory service. Experience has justified our determination to widen the scope and intensify the course for dental technicians at the Army Dental School. At the present time, the regular course covers a period of twelve months. Essential subjects, such as dental anatomy, physiology, metallurgy and dental materials, constitute the initial lecture courses. By means of lectures, motion pictures and demonstrations, the many phases of laboratory methods are presented simultaneously with an excellently prepared laboratory course. The many steps in full denture, partial denture, casting, crown and bridge and all other procedures essential to the training of an efficient technician are thoroughly presented. We believe that this course is of vital importance to the success of our laboratory service. Unquestionably, it has been an important factor in the success of our whole prosthetic service.

The results of the reorganization of our denture facilities are most impressive. Needless to say, progressive and sound organization and administration have not only improved the quality of our denture service, but have also re-

sulted in an increase in the amount of work accomplished.

In 1920, exactly twenty years ago, when the Dental Corps consisted of more than 450 dental officers, 3,660 dentures, for military personnel, were constructed in our laboratories. The Annual Report of the Surgeon General for 1930 records a total of 4,296 dentures, at a time when the Dental Corps consisted of only 158 dental officers. The 1940 report, just recently prepared for publication, shows that 10,840 dentures were constructed in our dental laboratories during the year ending June 30, 1940. The total laboratory operations, including dentures, bridges and repairs, were more than 17,000, with an officer strength of 243. This indicates not only that there is a notable increase in the denture service of the Dental Corps, but also that the present organization and administration of our laboratory service have resulted in an improvement in the quality of this service.

This plan for a high type of denture service operates to the great benefit of the Army. We have established a program that provides for adequately trained enlisted technicians, control and supervision of the laboratory service by officer personnel and equipment of every unit with the finest facilities obtainable. This project requires a total of fifteen dental officers and about 100 technicians, for our peace-time Army.

The problems in time of mobilization and war require a tremendous expansion of this laboratory service. Visualizing these problems today, we can present a most interesting perspective of just how our plans must expand to meet mobilization needs.

It is estimated that a large percentage of men, inducted into the Army in the operation of a compulsory draft law, would require extensive dental replacements. The men of military age today will certainly show the lack of dental care during the depression years. This condition must not be permitted to constitute a disqualifying factor to the extent that conditions indicate. Both the Army and the Navy report that an exceedingly large number of men applying for enlistment have been disqualified because of dental defects. However great our desire to maintain high dental standards for military service, we must realize that the safety of our nation depends on trained manpower. If the situation at present indicates a lowered state of dental health among those of military age, we must provide the means for adequate dental service to correct the dental health of drafted men. The entire plan for dental service in time of mobilization has been revised to meet the conditions which we are certain will exist in every Army camp.

As compared with established procedures at the time of the World War, there is a great improvement in dentistry's approach to these problems today. Owing to the expression of many sound convictions, our attitude in regard to pulpless teeth has greatly changed. Twenty years ago, a great effort was made to restore infected teeth. In 1920, more than 20,000 root canals were filled and 69,805 teeth were extracted.

In 1938, 874 root canals were filled and 89,842 teeth were extracted. Today, we are not attempting to restore teeth the presence of which might adversely influence the health of Army personnel. Efficient dental replacements have been devised, and a higher type of full and partial denture service is available. Greater assurance is ours in planning a service for the health and comfort of the soldier. Defective teeth, with the pulps involved, will be extracted, and the laboratory service will be expanded to meet the needs as the strength of the Army increases.

Plans creating laboratory facilities to meet the needs for denture service provide for spacious laboratories at the large training centers. In addition to the

central dental laboratories now in existence, a dental laboratory will be established in each divisional camp. Also, two other types have been planned for large troop concentrations, one consisting of three dental officers and twenty-five technicians, and the other staffed by six officers and fifty technicians, the type to be adopted being contingent upon the size of the camp. These are designed for a complete laboratory service with all the facilities required for the most desirable type of replacements. The plans for the buildings, the allowances for equipment and supplies and the many details necessary for efficient organization and administration have been prepared. These units, so located as to best serve all the dental clinics in the training camps, will not be an integral part of any other dental installation. They will function in the same manner as do our large laboratories today. We confidently expect these units to meet our needs in the great problems of denture service, assuring the Army of a new standard of dental health in time of war. All of us can appreciate the importance of dental health as a factor in the maintenance of the health of the Army. We must plan to meet this problem, and dental service must be provided during the early months of training.

Mobilization constitutes a great problem, but when the troops move from training centers into the theater of operations to engage in combat, we are confronted with other demands and newer problems. The theater of operations is divided into two main sections—the communication zone and the combat zone. In the communication zone will be found the large establishments for supply, the many troop centers and the many large hospitals and other installations set up to provide medical care for battle casualties; while in the combat zone will be found the troops in the battle area and those supporting them. In the communication zone, the many different types of medical department units are established in fixed or permanent buildings; but, in the combat zone, all units are mobile and consist of only the absolute necessities for treating war casualties and transporting the injured from the combat zone to the large hospitals in the communication zone.

Although there will be a great demand for denture repairs, etc., in the combat zone, it is impossible to provide any fixed laboratory facilities in that area. The character of denture service and laboratory requirements changes in the theater of operations. Splints for all types of jaw cases create an entirely new and comprehensive type of laboratory service in the general hospitals of the communication zone, where the organization of the laboratory service is more specialized, and elaborate equipment and skilled personnel to meet this special demand are available.

There is another serious problem in connection with the denture service in the combat zone. It is estimated that 1 per cent of the division personnel will require denture service upon returning to camp in a rest area after leaving the battle area. Many dentures will have been lost; many will have been broken. It is impossible to permit these patients to leave their organization to secure needed denture service, and the dental officers with the division are not equipped with any laboratory facilities.

To meet this problem, it has been found necessary to create a new mobile laboratory unit, the organization and function of which is very interesting.

That you may understand the problems of dental service in the combat zone, I will give you a glimpse of just how armies are organized for combat. A field army consists of three army corps, consisting of three divisions each. These troops cover a certain number of miles on a battle front and to a depth of 30 or 40 miles, where the divisions are in actual combat or contact with

the enemy. Behind the divisions are the corps troops, and in the rear of the combat zone are the army troops. These corps and army troops consist of all types of combat, supply and technical units, ordered into action by competent authority when needed. In this organization are the additional medical units backing up or supporting the establishments which care for the wounded and the sick. For instance, the surgical and evacuation hospitals, the big supply agency that forwards all the medicine and supplies to the units at the front, and the ambulances that transport the injured to the hospitals in the communication zone are a part of the medical service of a field army. The new mobile field dental laboratory, naturally, would be a part of the Army Medical Service.

A field army, which consists of 375,000 men, requires a considerable group of laboratories to meet the expected demand. We have provided for six of these mobile laboratories, which will constitute a distinct unit in the Army Medical Service. Each laboratory will be available to move to any given point or rest area, to provide denture service as needed. Having received orders to move to a specified rest area, on arrival it will establish itself at the division medical battalion, where the dental service is set up, and it will immediately prepare to serve the personnel requiring its services. The laboratory is equipped for all types of laboratory service and its personnel consists of one dental officer (prosthetist) and three dental technicians.

An adequate and superior type of denture service is just as essential in the military service as in civil life. It must be available under the varied conditions and situations common in military operations both in peace and in war. Nothing but perfect denture service can be accepted as a standard in the military service, and this standard must be available from the Army Medical Service on back to the hundreds of installations throughout the communication zone and the zone of the interior. The magnitude of the dental service in time of mobilization and war is not fully appreciated by the dental profession. The quality of its service must be the serious concern of organized dentistry.

Through the stimulating efforts of the American Dental Association, military dentistry enjoys a status today that assures us of all the essential elements for an excellent dental service in time of war. We must plan for its development and the selection of a personnel essential for the perfect service which must be provided for the American Army in event of mobilization or war. It must be dentistry's contribution to national defense. It must stand as our national effort in the great defense program now engaging our national energies. American dentistry, the standard of the world, must find its most useful and brilliant expression in the denture service provided for the Army in time of war. Our great interest in denture service will find its satisfactory expression in the plans that we have provided, and our continued aid and participation in event of mobilization will assure us of a service in keeping with the high standards established by the American dental profession.

THE JOURNAL *of the*
AMERICAN DENTAL ASSOCIATION

L. PIERCE ANTHONY, D.D.S., Editor
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THE INCREASING DENTAL NEEDS

THE increased need for dental service created by the preparations for national defense has directed the attention of the dental profession to the circumstances which have led to what is threatening to become a serious shortage in dental man power in the Army, in the state and in the various industrial activities incident to the preparedness program.

The revelations of the physical examinations conducted by the draft boards in regard to the rejection for army service of a distressingly large percentage of those drafted for military service because of defective teeth have raised serious questions as to ways and means of correcting the conditions.

In about 25 per cent of draftees rejected on physical grounds, the cause of rejection has been dental defects; and, again, when those who have been accepted by the draft boards come before the induction boards, another considerable percentage are rejected because of dental defects. The large number of rejections in the second step of the draft procedure has fixed the attention on dental defects and has given rise to an effort to reduce the percentage of rejections, at least at the induc-

tion centers, by appointing dentists to serve on all draft boards—about 6,400.

The addition of a dentist to the examination draft boards will undoubtedly reduce the number of rejections by the induction boards, but we may expect an increase in the number rejected by the draft boards. If the examining boards, without dental representatives thereon, reject such a large percentage for service because of the dental condition, it is only reasonable to conjecture that a much larger percentage will be rejected when draftees are subjected to examination by dentists.

We are not in any manner reflecting on the ability of the medical man to determine the general physical qualifications of the draftees, but we are conscious of the shortcomings of the physician when conditions of the mouth are in question. The members of the medical profession have long since delegated the care of the mouth and teeth to the dentist, and most of them not only disclaim any particular knowledge of the teeth, but also almost boast of their lack of knowledge of or interest in mouth conditions.

In the olden days, the physician was wont to place some value on the appearance of the tongue as a diagnostic aid, but now it seems that the only part that the mouth plays in the diagnostic procedure is as a vocal source of confirmation on the part of the patient of symptoms observed by the physician.

In view of the number of dentists involved in supplying draft board examiners, the dental profession, through the preparedness and legislative committees, is endeavoring to restrict the services of dentists called to army service to strictly professional rather than to military line service.

It is estimated that there are about 21,000 dentists within the draft age, but that, after exemptions and disqualifications, only about 6,700 of these will be available for service; therefore, efforts are being made to have all those eligible placed in the Army Dental Corps.

We disclaim any desire or intention on the part of dentistry to avoid military service, or any lack of patriotic loyalty, but we do believe that the dentist can render better service and can even better discharge his patriotic obligation to the country as a dentist than he can in the actual fighting ranks. If dental service is a worth while health service in the army, and we believe that this has been amply proved, it will be a needless economic waste to utilize the dentist in any other capacity than in health service.

This economic aspect of the question brings us to the question of a reasonably adequate dental service to the public in the light of the drafting of dentists to military service. We must not forget the obligation of the profession to the public, and the depleted service available to the public because of Army obligations will create embarrassing demands upon the profession, which we are illy prepared to meet in view of the fact that the number of men entering dental practice is smaller each year.

Included in the general effort to limit the services of the dentist to professional service is the supplemental and definitely related one of deferring the calling of the present dental students for military service so that they may continue and complete their dental education.

The number of students entering dental school and thence the profession has been decreasing almost steadily since 1924, and this year the number of graduates reaches what we hope to be the low mark since 1900—less than 1,600 being qualified to apply for licensure.

We may be unduly apprehensive regarding the decrease in numbers of students, but the profession has so complacently watched this steady decrease over the past two decades that we have almost come to view it with real alarm.

The reasons for this steady decrease have been several and varied, but relatively few of them can now be eliminated. Some of them are merely a part of the evolutional progress of dentistry, and need not or cannot be eliminated; nor is it desirable, unless we wish to retrace our advance steps in the development of dentistry to its present high educational standard.

Beginning more than two decades ago, when the course of study was first extended to four years, the decrease in number of students has been considerable with each increase in the educational requirements, and it seems that no sooner had we recovered from the influence of one educational advance than we were faced with a new one. Today, when we have survived the retarding influence of the present standard of two years of academic study in preparation for the four-year professional course, Harvard has now projected a plan that will add another year to the professional course.

According to the view of the Council on Dental Education, whose annual students' register we publish in the present issue, the marked drop in the number of graduates in 1941 has an accumulation of definite causes, being due in part to the general economic situation and in

part to the advancing of requirements in dental education in recent years.

In commenting further on the decrease in the number of dental students, the Report by the Council says:

> The situation with which the profession and the public are confronted this year is a shortage of at least 750 new practitioners to maintain the present ratio of dentists to population. When the number of dentists likely to be called into military training and service is also taken into account, it will readily be seen that the recruiting of more well-qualified students to enter upon the study of dentistry is of very great importance.

This reduction in man power in dentistry has been noted in other than strictly dental circles. At the hearing before the Military Affairs Committee of the Senate of the Murray Bill S. 783, a short time ago in Washington, when medical and dental committees and individuals appeared, this state of affairs was aired before the committee of the Senate. Senator Lodge of Massachusetts and Senator Reynolds of North Carolina, members of the Military Affairs Committee, and Senator Murray of North Dakota, author of Senate Bill S. 783, asked the dental representatives some pertinent questions as to why the number of students was decreasing and what the profession was doing to correct the condition.

Peculiarly and incidentally, Harvard says that it has increased the dental course because they find they cannot educate a dentist in four years. There are several implications that could be drawn from this, but the main one, namely, that the special education of the dentist requires more than education for medical practice, we do not consider applicable. The product of the dental schools of today refute such an implication. We believe that the educational plan as conducted by the leading schools today offers abundant proof of the fact that a high-grade, efficient and capable dentist can be produced in two years' academic study and a four-year professional course.

In the light of the trend toward decreasing matriculants in the dental schools, we suspect that the restrictions placed on the number to be accepted in the new school at Harvard will not be necessary.

The students' register as compiled and issued by the Council on Dental Education of the American Dental Association, and published in the present issue, promises a correction of the deficiencies in the dental educational course and an increase in the number of students entering dentistry. The registration for 1940-1941 shows an increase of more than 300 matriculants over those of last year, and this we hopefully interpret

as a trend in dental education that will remedy some of the conditions that we have had under consideration.

On the whole, we still believe, as we have on several previous occasions stated, that the dental graduate with two years of academic preparation and four years of discriminately chosen professional education is better prepared for his job than is any newly graduated specialist in any other specialty of the healing art.

A QUESTIONS AND ANSWERS DEPARTMENT

IT is our intention to inaugurate, as soon as the conditions warrant it, a department of questions and answers, in which we shall undertake to answer any questions on dental practice which may arise in the minds of our readers and which they may desire to present to THE JOURNAL for answer.

Questions will be referred for attention to authorities on the particular subject on which the question is asked. We solicit questions from our readers on any phase of dental practice on which they desire enlightenment.

BIBLIOGRAPHICAL

Lectures on Military Dentistry

Collected Lectures on Military Dentistry from the Army Medical and Dental Schools. 104 pages. 82 illustrations. 1941. Price 75c. Published by the Dental Preparedness Committee under authorization of the American Dental Association and with the permission of the Surgeon General of the United States Army.

THROUGH the publication of "Lectures on Military Dentistry," the Preparedness Committee is presenting a volume which can be of vital use to the profession in the defense program of the nation. This publication can be used by organized study club groups as a basis for home study of the treatment of conditions incident to the defense training program and actual warfare. It is prepared in the form of sixteen lectures, each lecture dealing with a particular phase of dental science in its adaptation to the defense program.

Orders for this publication should be directed to the American Dental Association, 212 East Superior St., Chicago, Ill. To facilitate the handling of the orders, cash should accompany each order.

Dental Health Education and Dental Health Service in Hawaii. By Guy S. Millberry, D.D.S., F.A.P.H.A. 181 pages, illustrated. The Strong Foundation, Honolulu, Hawaii.

CONTRARY to common opinion, Hawaii is not only a land of leis, ginger blossoms,

music and mirth: it is a land of social accomplishment as well. Its public health activities are outstanding and, in organized form, antedate those of all states in the Union. Hawaii pioneered in public health and preventive dentistry. Public dental service for the low income group was inaugurated in 1914 when members of the Honolulu Dental Society volunteered free service to the wards of Palama Chapel. In 1920, the Honolulu Dental Infirmary, now known as the Strong-Carter Dental Clinic, was established. In 1921, Hawaii enacted legislation making the teaching of dental hygiene compulsory in its public schools.

The author has made a complete study and report on all phases of Hawaiian dental activities, including the Strong-Carter Clinic, the division of dental hygiene and the school dental program, the self-supporting school dental clinics, the course of study for dental hygienists and Hawaiian dental legislation. He makes suggestions and recommendations for the integration and improvement of the various services, weaving into the entire text his own ideas regarding preventive dentistry, gained from years of experience in the field.

The Control of Pain in Dental Practice

A Symposium Conducted by the Academy of Stomatology, Philadelphia. Edited by J. L. T. APPLETON, D.D.S., School of Dentistry, University of Pennsylvania. Cloth. 195 pages. Price $3. Philadelphia: J. B. Lippincott Co. 1940.

THIS book consists of eight papers previously delivered before the Academy of Stomatology by various essayists, each covering a specific phase of the general problem of the control of pain during dental procedures. Since this difficulty is one that the dentist encounters more frequently than any other in practice, it is evident that such a symposium should be of considerable interest. The first six chapters are concerned with the phenomenon of pain from anatomic, histologic, psychologic and physiologic aspects. Here one finds clear descriptions of the mechanism of pain production, the anatomic pathways involved, the importance of the psychologic approach to the treatment of pain and the effects of certain anodynes and sedatives on pain. The last two chapters are written specifically on the control of pain in dental procedures. The effects of instrumentation, burs versus cutting instruments and various physical aids in controlling pain are discussed. The concluding chapter deals with the use of drugs in controlling pain and presents a number of suitable prescriptions which may be utilized by the dentist for control of the sensitive or apprehensive patient. The book in its entirety is written from the practical aspect. The authors of each of the chapters are exceptionally well qualified in their respective fields and the volume presents an interesting and valuable contribution to this phase of dental practice.

Ceramics in Dentistry

By MILTON COHEN, D.D.S., F.S.C.D., formerly Professor of Crown and Bridgework and Clinical Professor of Dental Ceramics and Ceramic Technology, New York University, College of Dentistry. Cloth. 335 pages with 696 illustrations. Price $10. Philadelphia: Lea and Febiger. 1940.

THIS new work is an important contribution to the literature on the use of porcelain in dentistry. By means of a brief but explicit text giving detailed steps in construction, plus the profuse use of excellent illustrations, the reader is conducted through the preparation of porcelain inlays, porcelain jacket crowns, continuous gum dentures and fixed and removable porcelain bridgework. All conceivable steps are described and, in many cases, illustrated, to provide the greatest expediency in teaching. For example, eighty pages are devoted to the preparation of teeth for porcelain jacket crowns. The preparation for anterior teeth and for bicuspid and molar teeth also is fully covered. Illustrations are provided to indicate in logical sequence instrumentation and the right and wrong way of producing preparations. Forty pages are then devoted to the impression and die and matrix technic, and here too several acceptable methods are described. The next chapter of forty pages deals with the application of the porcelain to the matrix, the selection of colors, the application of the colored porcelain and the condensation and fusing of the porcelain. There is an adequate discussion of the physical properties of porcelain and the methods of controlling them. The book is printed on clear paper in easily legible type.

It is attractively bound and is one of the best books on clinical prosthetics to appear in some time.

Injuries of the Jaws and Face

By W. WARWICK JAMES, O.B.E., F.R.C.S., L.D.S., Eng. Member of the Army Advisory Standing Committee on Maxillo-Facial Injuries; Consulting Dental Surgeon to Middlesex Hospital, Etc.; and B. W. FICKLING, F.R.C.S., L.D.S., Eng. Assistant Dental Surgeon to St. Georges Hospital and to the Royal Dental Hospital of London. Cloth. 199 pages with 194 illustrations. 1940. Price 15 shillings net. John Bale and Staples Limited, London.

THIS work has been written to provide a handbook for the dental surgeon giving detailed information on the care of jaw and facial injuries. The material, which was derived from the last World War, reports the assembled records of the many cases of this character treated at that time. Throughout, actual cases are used to illustrate the material under discussion. The book may conveniently be divided into two parts for discussion. The first deals with the immediate treatment of face and jaw injuries; the second discusses the later corrective treatment often necessary. It is evident that the clinical material seen in civilian life varies from the war casualty type in extent and degree of trauma. In addition, the effects of gunshot wounds of the face depend on the entrance and the exit of the projectile, and particularly on the number of foreign bodies and secondary projectiles. The soft tissues and the hard tissues must frequently be treated independently for a time. The principles of immobilization for fractures of the jaws is described. The authors prefer to use interdental wiring for most cases, reserving cast splints and other devices for those cases that do not lend themselves to dental fixation. The construction of the splints is adequately described and other supports that may be necessary are illustrated. A discussion of the treatment of complications and the use of bone grafts in restoring the continuity of the shattered mandible completes the text. This is a useful, well-written and authoritative compendium on the treatment and care of serious types of war injuries. It should prove particularly useful to those dealing with the organization of maxillofacial divisions in the national defense, as well as to dental surgeons and others taking a professional interest in these injuries.

P. Carl Petersens Fonds Ernaeringsekspedition Til Faeroerne 1936-1937 (The P. Carl Petersen Foundation's Nutritional Studies in the Faroe Islands 1936-1937)

Paper. 501 pages. 1940. Nyt Nordisk Forlag, Arnold Busck, Copenhagen.

DENTAL research, and especially research in dental caries and in periodontia, suffers at many points from a lack of detailed and well-controlled observations. As if in answer to this need, there has appeared this detailed study of the inhabitants of the Faroe Islands, a well-planned and carefully executed study of this branch of the Scandinavian family. Included in the report is a delightful discussion of the land and its people, as well as their food and their physical and mental characteristics. The data obtained are carefully evaluated by statistical methods wherever possible.

Of particular interest to dentists are the sections of the book devoted to dentistry. Most of the dental observations were undertaken by Oscar Kacher. Extended discussion of the findings is presented by J. J. Holst. The following conclusions, among others, were drawn from the data at hand:

1. More than 95 per cent of the persons examined had carious teeth.

2. In permanent teeth, no relationship between caries frequency and hypoplasia could be demonstrated.

3. There appeared to be no relationship between lack of oral hygiene and dental caries.

4. The state of health of the supporting structures was generally good. Only about 7 per cent of those examined showed clinical symptoms of severe gingivitis or of severe periodontal change.

The foregoing remarks and conclusions are merely indicative of the scope and character of the report. Research workers in this country, unfamiliar with the Danish language, may still derive benefit from a study of the report since the graphs, tables and summaries are given in English.

H. L. H.

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President's Page

To All State Dental Association Officers and Members:

IT is my wish that your annual state meeting this year shall be most successful and that the educational program and the attendance shall more than exceed your expectations.

THE ANNUAL MEETING

May is the time of the year when dentists begin to feel the urge to attend the annual state dental meeting. They have just passed through the trying months of winter, confining themselves and their energies to their respective dental offices, where they have been busily delivering the service their patients have demanded.

But now the sun is shining, winter is past, the month is May, the birds are singing, the flowers are blooming and man himself is anxious for a change. It is too early in the year for the summer vacation, so the dentist's thoughts turn longingly toward the annual state dental meeting.

And why shouldn't he be eager to attend? The annual meeting of every state dental association marks the climax of all dental advancement for the past year. It not only offers to the member who attends an opportunity to refresh his mind in the practices in which he is so apt to become lax, but also gives him an opportunity to meet his brother practitioners and talk over those perplexing dental problems that he meets in daily practice. Finally, it keeps him abreast of dental progress.

Show me a man in dental practice who regularly attends the monthly meetings of his component society, who during the year meets his local colleagues in a study group and who climaxes the year with attendance at the annual state meeting, and I will show you a dentist who is successful in his profession. He not only is a success in dentistry, but also is more likely to be a financial success. He is looked upon in his community as one of the leading citizens, a man to be depended on.

On the other hand, let us look behind the scenes upon the dentist who has been out of college three or four years or more, and does not belong to organized dentistry, or at the dentist who is a member, but who is too busy to take time out of his office to attend his county and state dental meetings. What about him? Yes, he is too busy to progress. He forgets or does not know that he is on the threshold of dental failure; that only by a continuation of his quest for dental knowledge will he continue to be a successful practitioner. He prob-

ably, to quiet his inner conscience, will tell himself that, in a short time, he will join the societies if he is not already a member, or will find time to attend the meetings, but as month follows month, he finds the desire to become a member weakening, or the effort to attend more and more difficult, and before long he has lost the urge.

As far as he is concerned, this moment is the death knell to his success. He may continue to enjoy a lucrative practice for several years, but soon his technic becomes obsolete. His equipment becomes old and is not replaced. His office assumes a run-down appearance. His best patients, one by one, go elsewhere for service, and, on a bright, sunny morning on the first of some month, this dentist finds the rent due and no funds with which to pay. He does not understand why or how his condition has come about. He blames every one but himself for his failure and his shortsightedness.

Gentlemen, it pays to attend your dental meetings. Contact with the clinicians, the essayists and your fellow dentists keeps you abreast with progress in dentistry. Attendance keeps you alert to dental changes. Your practice technic improves and you become a more skilled operator, a better dentist and a more useful citizen in the community in which you reside.

Yes, it pays to attend your dental meetings.

Do not forget the Annual Meeting of the American Dental Association, Houston, Texas, October 27, 28, 29, 30 and 31.

Wilfred H. Robinson.

DENTAL PREPAREDNESS QUESTIONNAIRE

APRIL 19, 1941, only 46,057 of the questionnaires on dental preparedness had been returned, a return of approximately 66 per cent.

It is urgently requested that all members of the American Dental Association return their questionnaires at once. Even though a member may be beyond the age which would permit him to participate in a defense program, the return of the questionnaire is important because, by a compilation of complete statistics, the welfare of those of service age can be better protected.

This project is important from another standpoint. Surely every dentist in the United States will want to be listed in the proposed dental directory. If the proper information is not supplied, through the questionnaire, such listing is not possible.

If you do not have a questionnaire, one will be forwarded immediately on a request directed to the Committee on Dental Preparedness, American Dental Association, 212 East Superior St., Chicago, Ill.

COMMITTEE ON DENTAL PREPAREDNESS

DENTISTS ASSIGNED TO LOCAL DRAFT BOARDS

To the Chairmen of the State Military Affairs Committees, Society Secretaries et Al.:

THE Selective Service System has changed its regulations to authorize the assignment of dentists as examiners to local selective service boards, to serve in the same manner as medical examiners in their respective fields. These appointments will be made by the President of the United States upon nominations submitted by the governors of the various states. With this advance information in hand, please take the necessary steps to see that the names of nominees are made promptly available to the governor, and that your contacts with Selective Service Headquarters and the medical advisor to the governor are such as to insure the appointment of representative, patriotic and interested dentists.

As in the case of physicians and the members of draft boards, there is no compensation connected with these appointments, only the opportunity to serve the United States in its preparedness program, the community and the dental profession. Dentists between the draft ages or in the Reserve Corps are not especially desired for this service, unless they have a deferred status, or unless, in some communities, it is impossible to obtain other volunteers. In other words, it is felt that here the older dentist is given an opportunity to perform a patriotic service. In the event that the work on any particular board is such as to entail an undue hardship on one dentist, it is permissible under the law to appoint others. It should also be borne in mind that large numbers of Negroes have been, and will be, inducted into the service, and provision should be made for the appointment of colored dentists where they can be used to advantage.

The foregoing action reached its culmination in a conference held the afternoon of March 6, 1941, between Col. L. G. Roundtree, General Hershey, Colonel Eanes, Colonel Baggs and other Selective Service officials and the advisory committee to Selective Service consisting of C. Willard Camalier, Chairman of the American Dental Association Dental Preparedness Committee, J. Ben Robinson, William Hodgkin, Sterling V. Mead and Brig. Gen. Leigh C. Fairbank.

Now that dentistry has been given the opportunity to serve in this capacity and to bring its knowledge to bear on various important matters within the boards, it is believed that dental examinations under Selective Service will be greatly improved, as well as the situation respecting the dental student and the dentist within draft ages. The knowledge of the dental appointee and the enhancement of the profession's status because of the appointment should contribute much to improve the entire situation.

Selective Service has been assured that dentistry would meet its obligations in this matter, and when the President of the United States calls for this service from not less than 6,000 of its members, it is believed that the profession will respond promptly and gladly.

For the information of your committee, dental examiners on local and induction boards and others, a comprehensive circular will shortly be published by Selective Service, giving definite procedures to be followed in the examination of selectees, interpretation of regulations, minimum equipment necessary

and other pertinent information. A companion circular of interpretations for induction boards from the Surgeon General of the Army has been issued.

Respectfully submitted,
Committee on Dental Preparedness,
C. G. BROOKS
EDWARD H. BRUENING
H. O. LINEBERGER
J. BEN ROBINSON
J. T. O'ROURKE
L. M. WAUGH
C. WILLARD CAMALIER, *Chairman*
G. D. TIMMONS, *Secretary*

BUREAU OF PUBLIC RELATIONS

INFLUENCE OF DENTURES ON RADIO SPEECH

FROM L. C. Cox, Tonganoxie, Kan., a letter came to the Bureau of Public Relations, a few weeks ago, with a complaint that will meet with sympathetic reaction on a national scale:

While listening to the radio from one day to another and especially during political campaigns, I frequently find it necessary to turn the speaker off because of whistling, caused by the poor fit of dentures or by other dental ills. I think that this is a challenge to the dental profession to place an educational program before the people to teach them that a prerequisite to attractive radio speech is a healthy mouth.

A short time later, as the Department pondered ways and means to comply with a request that will find echoes among the nation's radio listeners, this sprightly bit from a New York newspaper came across the desk:

Occupational Hazard: Been on the air fourteen years as a top-flight network announcer, this 40-year-old fellow we know. For the last two years, he's been having a deuce of a time with his teeth, shaky molars and bad bicuspids. But he's steadfastly refused to have an artificial denture. He fears that artificial dentures would put a hiss in his commercials and he refuses to become a sound effect.

Forthwith, Dr. Cox's letter, the newspaper clipping and the Department's interest in the problem were referred to one of the nation's best informed men on the matter of speech and radio technic—Wynne Wright, production manager, Central Division, National Broadcasting Company.

As members of radio audiences, we are indebted to Mr. Wright for some of the top ranking radio programs.

As dentists, we are indebted to Mr. Wright for his forthright opinions on our responsibilities in reducing the sharp sibilant sounds, whistling, lisping and other annoying speech defects that now clutter the ether as quiz programs, political campaigns, etc., bring more and more laymen to the microphone.

Mr. Wright started his discussion of speech on the radio with a few fundamentals. The microphone, he explained, does not exaggerate, as is commonly believed. It simply records accurately. It is the concentration of the listener that makes every slight slip and every slight defect in speech boom out so annoyingly.

That is why many excellent actors and actresses on the legitimate stage are very poor on the radio. The physical action and color of a stage production make the audience far less acutely conscious of the actor's speech than when the voice alone is presented, as on the air.

In good radio speech, according to Mr. Wright, there are two fundamentals: First, the speaker must possess the will to speak correctly and, second, he

must have the proper equipment. The will to speak correctly carries with it, of course, a respect for, and a consciousness of, good speech—really, a love of and appreciation of good speech.

The equipment consists of a good, healthy, well-formed mouth and teeth in perfect condition.

Professional announcers, actors and actresses all have the first requirement, otherwise they would not be professionals. The second requirement frequently determines success or failure on the air, and professional radio people consider excellent dental care of primary importance.

As to the lay people who come before the microphone, Mr. Wright shakes his head sadly. Most of them lack the will to speak correctly and have little knowledge or feeling for proper speech. In many cases, poor teeth are the original cause of this lack.

Younger people, especially, are embarrassed by poor teeth. They are afraid to open their mouths, develop a self-consciousness and naturally drift into habits of slovenly speech as their jaws and lips lose flexibility. Mr. Wright goes so far as to say that the mental handicap of bad teeth is responsible for a great deal of present-day improper speech. A person who is conscious of his poor teeth simply is not normal and his speech reacts to this ever-present thought.

Bad influences at home and in school often result in poor speech. Proper influences can awaken young people to the will to good speech, Mr. Wright declares. Right now, it never occurs to a majority of youngsters that their speech can be improved.

The radio production man is constantly on the alert for speech defects when broadcasting a program. Obviously, if an actor or announcer suddenly starts uttering harsh or whistling "s" sounds, the first question the production man asks is: "How are your teeth?"

Frequently, whenever an oddness of speech is heard, directors suggest that the actor or announcer consult a dentist immediately, to see whether it can be corrected.

When aspiring actors appear for auditions, the first interest of the director is to determine whether the applicant has talent. If he has, and his speech is defective, the director suggests that a dentist be consulted and that the aspirant undertake speech corrective courses as well.

Finally, Mr. Wright pointed out, the dentist has a grave responsibility when his advice is sought, especially in the case of radio announcers and actors, whose livelihood depends so definitely on their speech.

The actor in his forties might have a good mouth and does not think of the day when he may lose his teeth. If the time comes for him to use dentures, his entire future will lie with the skill of his dentist.

Wynne Wright gives the clear impression that dentists can do a great deal to help the speech of the nation by emphasizing to their patients the points made by this veteran NBC producer regarding the will to good speech. Dentists must also appreciate the responsibility that is theirs when treating not only radio announcers and actors, but the rank and file of patients as well.

Above all, the education of the general public to the value and importance of a healthy mouth must go ahead as vigorously as possible. It is dentistry's first duty to educate public and profession alike to maintain the natural teeth in a healthy condition and thereby prevent themselves from becoming human juke boxes.

BOY AND GIRL SCOUTS OF AMERICA

MOTIVATED by P. W. Trowbridge, the Third District Dental Society of Louisiana, early in 1938, passed a resolution recommending that members display in their reception room a Boy Scout and a Girl Scout Manual. The following year, both the Louisiana State Dental and the Louisiana State Medical Association passed similar resolutions. This worthwhile movement was then brought to the attention of the House of Delegates of the American Dental Association and that body, at the Eighty-Second Annual Meeting, passed the following resolution:

WHEREAS, we, the citizens of America, fully realize that training in Boy and Girl Scout work develops character, initiative and constructive attitudes toward the American form of government, and educates the youth of the nation in the duties, privileges, rights and responsibilities for the future; and

WHEREAS, the American Dental Association can materially assist in educating the public to the value of this work, by dissemination of the knowledge of the Scout movement contained in the Scout manuals, therefore, be it

Resolved, that the House of Delegates recommend to the general membership the placing of the Scout manuals on the reading tables of their reception rooms to help spread this knowledge so helpful to the youth of our land.

Any effort made by the American Dental Association to further the aims, raise the ideals and promote the activities of the Boy and Girl Scouts of America is to be commended. The placing of Scout manuals on the reception room table is a small, but important contribution to American youth which every practicing dentist might well make.

THE BOY SCOUT MANUAL: A WORLD'S BEST SELLER

By JAMES E. WEST,* New York, N. Y.

NEXT to the Holy Bible, the Handbook for Boys, the Boy Scout Manual, has been, since it was first published in 1910, the world's best seller. Copies numbering 6,900,000 have been issued. When you consider that each copy is, by a conservative estimate, read by at least four persons, and, in many cases, by nine, ten, yes, even more, you see the enormous number of people who have been affected by this book. Librarians tell me that in some cases the book has literally been read to pieces.

We who have been connected with the development of this book are not surprised by this record. We believe that it is based not only upon the widespread interest in Scouting, but also upon the fact that the Handbook itself presents such a wide variety of interesting material. The nature material alone, for instance, makes it really an encyclopedia for every one interested in the out-of-doors. Trees, fishes, native wild animals, the stars and the heavens and the flowers of the earth all come within its scope. For those who are interested in handicraft, there is ample material. Campers find help in the material on outdoor shelters, outdoor camping, fire making, map making, sleeping bags and pack sacks and other practical suggestions. Technical experts are interested in the sections on tracking, signaling, first aid,

*Chief Scout executive and editor of Boys' Life.

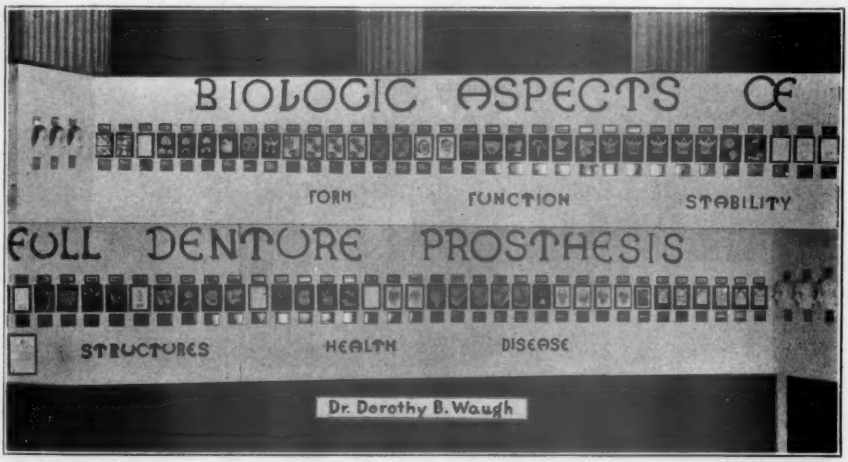
health hints, safety hints, weather lore and various kinds of knot tying. There is a section on our country's flag and how to display it. There is inspirational material and historical material. In short, there is something for everybody.

The book was developed out of the experience of many people. Every technical detail has been the subject of conference and correspondence with experts. For the first edition, published in June 1911, tons of typewriting paper were used, literally tons, in sending out the material to be checked. Then 5,000 copies marked proof edition were printed. A list was compiled of 4,600 names comprising everybody in America who was related to boys' work. This proof edition was submitted to them, and, from their comments, revisions were made and the first edition was published. Perhaps never was a book published with so many contributors.

Certainly, with the exception of the Bible, never was a book published which over the same period of time exerted a wider influence upon its readers. A whole new generation of boys has grown up under its influence. Today, there are in Scouting the sons whose fathers first came into the movement as Tenderfoot Scouts, and learned their Scouting from the "Handbook for Boys."

In the past three decades, more than 9,000,000 persons have been connected with the Boy Scouts of America. During these critical days in our country's history, more than ever we feel that American youth needs the stabilizing influence of a program such as Scouting and needs the opportunity to take part in a vigorous, healthful program of out-door activities, which have for their objective character training and building boys into the kind of citizens that America needs.

It is hoped that many dentists who may care to help the program will buy a copy of the "Handbook for Boys" and make it available in their waiting rooms. Undoubtedly, this would result not only in interesting boys who might not otherwise come within the scope of Scouting and helping them to secure the benefits of the Scout Program, but in enlisting the interest of men as well.



Biologic Aspects of Full Denture Prosthesis. This exhibit, presented by Dr. Waugh, won first award in Division B (Individual Scientific Exhibits) at the American Dental Association meeting in Cleveland, September 9-13.

I should be happy personally to write to any one who desires further information concerning Scouting. Copies of the handbook can be secured from your local Scout dealer at 50 cents, or from the National Office at 2 Park Ave., New York, N. Y.

The book has more than 650 pages with illustrations on practically every page.

ORAL HYGIENE PROGRAM OF THE DENTAL DIVISION OF THE DEPARTMENT OF HEALTH OF PUERTO RICO

BY OSCAR P. MONAGAS,* Santruce, P. R.

UNDER the direction of the Maternal and Infant Hygiene Bureau of the Department of Health of Puerto Rico, an oral hygiene program was started, in March 1940, with the establishment of five dental clinics in Mayaguez, Guayama, Arecibo, Caguas and Bayamon and the appointment of a dentist for each clinic, working part time. Later, five more dentists were appointed, and other clinics were established at Aguadilla, Ponce, Yauco, Humacao and Río Piedras. Other clinics will be opened in the near future.

Fig. 1.—Children in rural section waiting their turn in the trailer.

These clinics conduct a program of preventive and corrective dentistry for indigent school and preschool children. Prenatal corrective work is done among indigents.

Recently, two trailers with full mod-

*Dental Director, Puerto Rican Health Department.

ern dental equipment were obtained to care for the rural children who cannot come to the city clinics for dental work.

The dentists in charge of these clinics were selected by E. Garrido Morales, commissioner of the Health Department of Puerto Rico. All are qualified dentists who have been in practice more than five years.

Last July, I was appointed head of this department by Dr. Morales and, with the help of the doctors in charge of these clinics, we have been giving special attention to preservation of the first permanent molar. We have had considerable success.

An important aim of the oral hygiene program is dental health. The Junior Red Cross is helping in the distribution of toothbrushes and toothpaste. In the near future, conferences on dental care and distribution of educational pamphlets, charts and leaflets will be started and an exhibition of moving pictures will show the care of the teeth necessary.

The commissioner of health is fully aware of the need for dental care among children and, as time goes by and more funds are available, the oral hygiene program will be enlarged.

The following report shows the work done by these clinics to date:

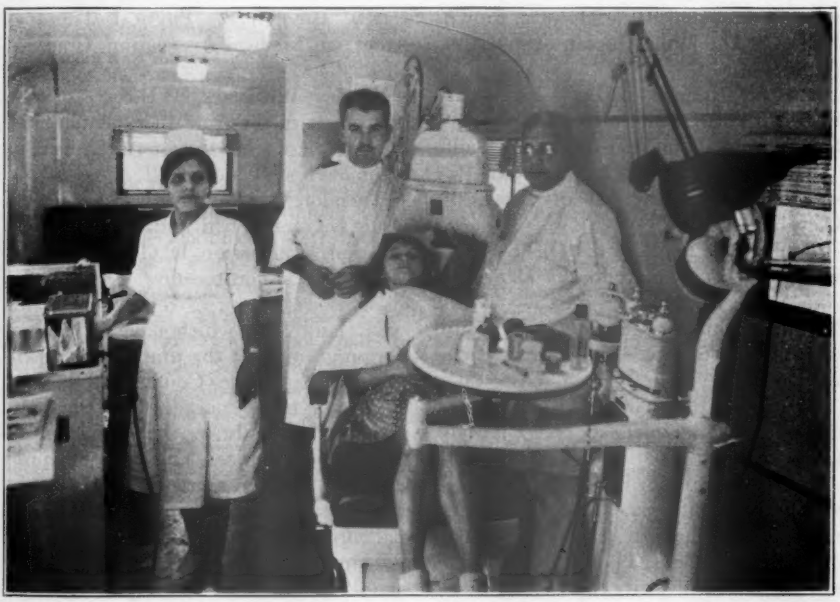


Fig. 2.—Inside the trailer.

Number of patients treated	21,476
Cases of prenatal care	2,901
Cases of preschool care	604
School children treated	17,971

Work done for the patients is as follows:

Extraction of infected teeth	20,512
Amalgam fillings	4,232
Synthetic porcelain fillings	1,393
Oral prophylaxis	2,973
Other treatments	660

COUNCIL ON DENTAL THERAPEUTICS

ANNUAL MEETING OF THE COUNCIL ON DENTAL THERAPEUTICS

THE twelfth annual meeting of the Council on Dental Therapeutics was held at the Shoreland Hotel, Friday and Saturday, February 14 and 15, 1941.

The following members of the Council were in attendance: J. Howard Brown, Ph.D., Sc.D., Johns Hopkins University, Baltimore, Md.

Paul J. Hanzlik, M.D., Vice Chairman of the Council, Stanford University School of Medicine, San Francisco, Calif.

Thomas J. Hill, D.D.S., Western Reserve University School of Dentistry, Cleveland, Ohio.

Paul H. Jeserich, A.B., D.D.S., University of Michigan School of Dentistry, Ann Arbor, Mich.

Harry Lyons, D.D.S., Medical College of Virginia, School of Dentistry, Richmond, Va.

Arno B. Luckhardt, M.D., Ph.D., Sc.D., LL.D., University of Chicago, Chicago, Ill.

John A. Marshall, Ph.D., D.D.S., University of California, College of Dentistry, San Francisco, Calif.

Victor C. Myers, Ph.D., Sc.D., Western Reserve University, Schools of Dentistry and Medicine, Cleveland, Ohio.

Harold S. Smith, D.D.S., chairman of the Council, Chicago, Ill.

Harold L. Hansen, Ph.D., secretary of the Council, director, A.D.A. Bureau of Chemistry, Chicago, Ill.

D. A. Wallace, Ph.D., associate chemist in the A.D.A. Bureau of Chemistry, was present at all sessions of the Council. The following men were present on invitation of the Council:

L. Pierce Anthony, D.D.S., Editor, JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, Chicago, Ill.

Franklin C. Bing, Ph.D., secretary, Council on Foods and Nutrition, and acting director, Division of Foods, Drugs and Devices, American Medical Association, Chicago, Ill.

Howard A. Carter, B.S. in M.E., secretary, Council on Physical Therapy, American Medical Association, Chicago, Ill.

Stanley W. Clark, D.D.S., professor of materia medica and therapeutics, and of Anesthesia, Northwestern University Dental School, Chicago, Ill.

Theodore G. Klumpp, M.D., chief, Drug Division, Food and Drug Administration, Washington, D. C.

At each annual meeting of the Council, it is customary to review the many events and facts which have influenced the program since the time of the previous meeting. The Council's task is a large and never-ending effort to apply scientific methods to the problems of dental therapeutics. This is not a program that can be carried on by a single group. It requires the moral and financial support of the profession, the active assistance of many consultants and the sympathetic interest of the public. From this, it should be evident that the significance of this phase of the Association's work is not to be measured in terms of single reports or a series of reports. These represent some of the steps essential to the development of a rational dental materia medica and, above all, to the attainment of the scientific ideal in dental practice. It was therefore encouraging to the Council to note that professional interest in and support of the program has been increasing and continual. The attitude and efforts of Council consultants have been particularly stimulating.

The Council has also been encouraged by numerous letters from members of the profession as well as from the public. Not infrequently, lay persons, after receiving information in response to requests, express surprise and satisfaction when informed that the service is rendered without charge. Also significant is the fact that more and more manufacturers are becoming interested in fundamental dental research and in acceptable promotion of products.

Among the items discussed at the meeting, the following will be of interest to the profession and to manufacturers.

BACTERIOLOGY

Within the past year or two, several articles dealing with bacteriology have appeared in this section of THE JOURNAL. In many respects, the available information on this important topic is unsatisfactory. In large part, this is due to the fact that the etiologic importance of micro-organisms in dental disease may vary with age, environment, state of well-being and other variable factors. Specific micro-organisms have not been identified as the principal cause of any one of the common dental diseases in the sense that primary causal relationships have been established for bacteria in other diseases. In such conditions as "pyorrhea," bacteria are undoubtedly of some importance, but they must be considered as secondary to other factors on the basis of present knowledge. The general principles expressed above appear to dental investigators and to most practitioners to be self-evident.

The fact remains, however, that numerous preparations advocated for the treatment of such conditions as Vincent's infection and "pyorrhea" are still being promoted on the basis of bacteriologic findings of questionable value and significance. Evaluation of germicidal or bacteriostatic products advocated for the treatment of dental diseases requires not only adequate and pertinent bacteriologic evidence, but also well-controlled clinical data.

In the collection of bacteriologic data, it is essential to keep in mind the severe limitations of most of the commonly used methods for evaluation of germicidal agents. It has long been recognized that phenol coefficients and similar arbitrary values may have no significance under practical conditions of use. Therefore, there is a distinct need for the development of tests which will provide evidence of more practical value. This is true not only for preparations used in dentistry, but also from those promoted to the public.

SULFANILAMIDE AND RELATED COMPOUNDS

Numerous requests for information on sulfanilamide and related compounds have been received in the Council office. In an attempt to meet the profession's needs, the Council has published three reports, two of which appeared in THE JOURNAL (25:1474, September 1938; 26:987, June 1939) and one in "Accepted Dental Remedies."

While scientific reports on sulfanilamide, sulfathiazole and sulfapyridine are voluminous, the amount of information on the local use of these preparations is comparatively scanty. Furthermore, the bacteriologic background for the available reports is completely lacking in most cases. When clinical findings are presented, the matter of controls has almost invariably been neglected. At the present time, claims to the effect that topical application of sulfanilamide in dentistry is of value are almost wholly inferential. Thus, in spite of several enthusiastic reports in the dental literature, the Council is unable to reach a conclusion on the merits of sulfanilamide and related substances for oral topical medication. Further investigation, in which provisions for adequate controls and bacteriologic studies have been made, is essential before the Council will be in

a position to give formal consideration to brands of these products.

Among other things, it was brought out that inert dusting powders might well be used for control purposes in studies relating to topical medication with sulfanilamide. In other connections, it has been reported that such substances as charcoal and talc exert some beneficial effect in wound healing.

ACCEPTED DENTAL REMEDIES

The Council is appreciative of the numerous reviews of "Accepted Dental Remedies," Edition 6, which appeared in dental, medical and pharmaceutic publications last year. There is sufficient evidence that the book is serving a useful purpose, not only in dental practice, but also in the training of dental students. Moreover, the use of this Association publication serves as an additional point of contact between the dentist and his professional organization.

LOCAL ANESTHETICS

The situation with respect to local anesthetic solutions was reviewed and it was concluded that the information in the current issue of "Accepted Dental Remedies" is not in need of fundamental revision. The Council was apprised of an investigation in the Bureau of Chemistry dealing with the effect of pH on local anesthetic solutions. This report will be presented for publication in the near future.

Aside from the discussion of the relative merits of "alkalinized" and acidic local anesthetic solutions, it was brought out that many manufacturers are abandoning the manufacture of the former type of solution because of its instability. In local anesthetic solutions which formerly contained disodium phosphate, this ingredient has either been reduced in concentration or eliminated entirely.

A consultant has informed the Council that extensive bacteriologic examination of accepted packaged local anesthetic solutions indicates that reasonable reliance can be placed on the sterility of such preparations. Whether the solutions are sterile when injected depends on a number of other factors.

DENTIFRICES

The consideration of dentifrices is a phase of the Council's work that is beset with more than ordinary difficulties. It has long been recognized that the available scientific evidence relating to these products does not warrant therapeutic or prophylactic claims for them. Unfortunately, claims of this sort are still being made. A review of the general situation shows, however, an increase in the number of products without objectionable therapeutic claims promoted to the laity. The numbers of accepted dentifrices listed in successive editions of "Accepted Dental Remedies" are as follows: Seventeen, eighteen, twenty-three, thirty-five, forty-nine and sixty-four. The last number refers to the products described in the sixth edition of the book.

During the past decade, the Council, with the cooperation of interested manufacturers, has brought about improvements in the composition of dentifrices. The Council's requirements for acceptance have effected, among other things, deletion of questionable ingredients from a number of products and improvement in the physical properties of many of them. Determination of the effect of dentifrices on all of the hard structures of the teeth exposed to their action is an exceedingly difficult problem. Work, now in progress in the laboratories of Council consultants promises to supply answers to some of the more pressing problems of a general nature in the not distant future. In the meantime, careful analysis of data obtained by the methods available at present is useful in the elimination of preparations harmful to the dental enamel.

Of particular interest is the fact that public awareness and support of the

Council's dentifrice program are growing steadily. Lay persons commonly write the Central Office asking why certain dentifrices do not bear the Seal of Acceptance. The public is coming to look upon the Seal as a symbol of products of satisfactory composition and promoted with reasonable claims.

The Council has considered numerous plans kindly submitted by consultants and others relating to the machinery for handling the dentifrice problem. It is significant that none of the plans advocated a diminution or cessation of the Council's efforts in the field. Plans proposed were considered in the light of professional and public interest, flexibility and effectiveness, and the present federal laws. It was concluded that continuation of the present program, with increased emphasis on Council requirements, is warranted by professional and public needs. The Council voted to require manufacturers to place the Seal of Acceptance on package labels of accepted dentifrices prior to use of the Seal of Acceptance in advertising.

ADVERTISING CLAIMS FOR CHEWING GUMS

A referee surveyed current advertising on chewing gums. It was noted that chewing gum is promoted by various firms with unwarranted claims relating to malocclusion, dental caries, muscle tone, stain removal, gum massage and whitening of teeth, and to analgesia in those cases in which a drug is incorporated in the product.

THE BARBITURATES

The Council has observed a growing interest in intravenous medication with the barbiturates. While oral administration of acceptable barbiturates is of value in dental practice, intravenous administration of these substances in the dental office should be resorted to only in emergencies. Intravenous administration of barbiturates for surgical anesthesia is a dangerous procedure, because of the relatively narrow margin between the toxic dose and the anesthetic dose. The danger is increased by virtue of the fact that it is almost impossible to determine in advance the dosage required. To this should be added the possibility of liver damage and other untoward effects such as alarming falls in blood pressure. In view of these unfavorable facts, the referee was unable to see the advantages in or desirability of production of anesthesia with barbiturates administered by the intravenous route, especially when inhalation anesthesia can be employed in its place. The Council voted to reaffirm its previously expressed stand on intravenous medication. (THE JOURNAL, September 1931, p. 1787.)

NUTRITION AND DENTAL HEALTH

During recent years, and particularly since initiation of the National Defense Program, there has been an increase in activities relating to diet and nutrition. Numerous committees have been set up to formulate suggestions for improvements in the diet of the American public and to put such suggestions into effect by a variety of means. It would appear, in fact, that the sum of these activities constitutes a mass movement to bring about rather fundamental changes in the national dietary. It is evident at once that developments in this field may have rather far-reaching effects on health, including dental health.

In addition, it must be recognized not only that economic factors play an important part in the unsatisfactory nutritional status of many individuals and communities, but that there is an inevitable relationship between economic and social forces and nutrition and health, at all levels. Without going into a detailed discussion of the various problems involved, mere mention of them should suffice to indicate the necessity for conservative action based upon the best evidence available.

In a broad sense, improvement in the

national dietary may be effected by any one or more of several methods or combination of methods. One method that has received favorable attention from various scientists and scientific bodies, notably the Council on Foods and Nutrition of the American Medical Association, may be labeled the method of restoration. Essentially, this consists of restoring to refined food products those naturally occurring substances that have been removed in the process of preparation.

The fortification of foods goes farther than this when the amount of dietary essentials added to refined foods is in excess of that which is present in the naturally occurring article. Also, there may be added vitamins, minerals and other substances that are not normally and naturally present in the unrefined foodstuff. There are cases in which fortification of foods appears to be in the interest of public health. A good example is the fortification of milk with vitamin D. Milk is an excellent carrier for the vitamin, but there may be difficulty in obtaining a satisfactory amount of the vitamin in the ordinary mixed diet. It must be kept in mind, however, that the principle of fortification carried beyond conservative limits results in sophistication of foods. It may also lead to practices contrary to the public interest on the basis of our present knowledge. Illustrative of this are attempts to add vitamins to chewing gum, cough drops and candy. Such measures appear to be solely in the interest of those in a position to derive commercial gains from the sale of the articles. There is evidence in the dental literature that an increase in consumption of highly refined carbohydrate foods, including candy, is not in the interest of the public health.

Over a period of years, the Council has maintained the position that addition of vitamins and calcium compounds to an adequate diet has not been shown to be of value in the treatment and prevention of dental diseases. In this connection, it is essential to consider the teeth and their supporting structures in relation to the organism as a whole. If the consumption of calcium and vitamin D, for example, is adequate to meet general bodily requirements, further addition of these essentials cannot be relied upon to prevent dental diseases. In a special article on the vitamin B complex, the referee indicated the necessity of conservatism in attempting to apply the newer knowledge of these substances in dental practice. Illustrative of this need is the number of requests received from the profession and the public on the treatment of Vincent's infection by the use of nicotinic acid, a member of the vitamin B complex. While a deficiency in this vitamin may be a factor in some cases of Vincent's infection, control tests have not confirmed the assumption that it is of specific value in the cases of Vincent's infection commonly observed by dental practitioners. The Council's general view of the problem of nutrition and dental health is in agreement with the conclusions of the Subsection on Dentistry of the American Association for the Advancement of Science. (*Science*, 93:137, February 7, 1941.) In the Subsection's report, it was brought out that dietary factors can influence the tissues supporting the teeth, but that our present state of knowledge suggests a general optimum diet rather than emphasis on any single factor.

PREPARATIONS CONTAINING ZINC OXIDE, ROSIN AND EUGENOL

Members of the profession have expressed considerable interest in cements containing zinc oxide, rosin and eugenol, and in Council reports on them. The names applied to proprietary preparations of this type are often unsatisfactory from the profession's standpoint. Many of these designations are based upon selected uses of the products and are

therapeutically suggestive, or uninformative.

The Council has approached the problem of nomenclature from the standpoint that the essential ingredients in preparations of this class are zinc oxide, eugenol and rosin. Preparations containing these basic ingredients have been in use for at least forty years and are widely recognized by practicing dentists. The Council voted to adopt the non-proprietary designation Zinc Oxide-Rosin-Eugenol Cement for preparations of this class, with the understanding that brands of this preparation containing other ingredients bear as part of the principal title the notation "With such-and-such ingredient (or ingredients)." It is understood that one of the requirements for acceptance of brands of such products shall be submission of satisfactory evidence of the desirability or need of inclusion of ingredients in addition to zinc oxide, rosin and eugenol.

EXHIBITS AND MEETINGS

During the past year, the Council's exhibit has been presented at the following meetings, in addition to the National Meeting:

Dental Centennial Celebration, Baltimore, Md.

Chicago Midwinter Meeting, Chicago, Ill.

Wisconsin State Dental Society, Milwaukee, Wis.

Denver Dental Association, Denver, Colo.

California State Dental Association, Oakland, Calif.

North Suburban Section, Chicago Dental Society, Evanston, Ill.

The secretary appeared before the following societies and groups, in addition to lay groups:

Northwestern University Dental School, Chicago, Ill.

University of Michigan, School of Dentistry, Ann Arbor, Mich.

Eighth Councilor District, Wisconsin State Dental Society, Watertown, Wis.

Outagamie County Dental Society, Appleton, Wis.

Columbus Dental Society, Columbus, Ohio

Odontological Society of Western Pennsylvania, Pittsburgh, Pa.

COUNCIL CONSULTANTS

During the past year, the following men have contributed to the work of the Council: Wallace Armstrong, Sumter S. Arnim, Basil G. Bibby, Franklin C. Bing, Howard A. Carter, Stanley W. Clark, A. A. Day, Edward Dobbs, H. C. Hodge, Philip Jay, Frank Kanthak, Paul Nicholas Leech, F. D. Ostrander, E. W. Skinner, M. L. Tainter and Harry True.

FEDERAL TRADE COMMISSION STIPULATION ON THYMO BORINE

THE Federal Trade Commission accepted from Thymo Borine Laboratory, 810 Plankinton Ave., Milwaukee, Wis., a stipulation in which it agrees to cease advertising that "Thymo Borine," sold for use as a mouth wash, deodorant and antiseptic, purifies the breath, mitigates inflammation of the mouth resulting from artificial teeth and stops perspiration odors or foot odors; that the preparation is a competent treatment for itching of the scalp or the skin due to skin bites, poisons or hives; that it is effective in treating athlete's foot, and that it is an effective germicide when used as a gargle. (Stipulation 02747.)

ACCEPTED DENTAL REMEDIES

The Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following articles in the list of Accepted Dental Remedies.

Anesthetics—Local*

Procaine Hydrochloride Solution 2% with Epinephrine Hydrochloride 1:25,000-Silverman: Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 gm.; epinephrine hydrochloride, 0.00004 gm.; sodium chloride, 0.005 gm., and sodium bisulfite, 0.0015 gm.; in distilled water.

Manufactured by K. Reisman, Philadelphia, Pa. Distributed by L. Silverman, Philadelphia, Pa.

Procaine Hydrochloride Solution 2% with Epinephrine Hydrochloride 1:25,000-Silverman in Cartridges, approximately 2.5 cc.

Procaine Hydrochloride Solution 2% with Epinephrine Hydrochloride 1:50,000-Silverman: Each cubic centimeter is stated to contain procaine hydrochloride, 0.02 gm.; epinephrine hydrochloride, 0.00002 gm.; sodium chloride, 0.005 gm., and sodium bisulfite, 0.0015 gm.; in distilled water.

Manufactured by K. Reisman, Philadelphia, Pa. Distributed by L. Silverman, Philadelphia, Pa.

Procaine Hydrochloride Solution 2% with Epinephrine Hydrochloride 1:50,000-Silverman in Cartridges, approximately 2.5 cc.

Procaine Hydrochloride Solution 2% with Neo-Synephrin Hydrochloride 1:2500-Silverman: Each cubic centimeter is stated to contain procaine hydrochloride 0.02 gm.; neosynephrin, 0.0004 gm.; sodium chloride, 0.005 gm., and sodium bisulfite, 0.0015 gm.; in distilled water.

Manufactured by K. Reisman, Philadelphia, Pa. Distributed by L. Silverman, Philadelphia, Pa.

Procaine Hydrochloride Solution 2% with Neo-Synephrin Hydrochloride 1:2500-Silverman in Cartridges, approximately 2.5 cc.

Dentifrices†

Grants Tooth Paste: Composition: See Comfort Brand Tooth Paste (A.D.R. Ed. 6, p. 115).

Manufactured by Comfort Manufacturing Co., Chicago, Ill. Distributed by W. T. Grant Company, New York, N. Y.

Warrens Tooth Paste: Composition: See Comfort Brand Tooth Paste (A.D.R. Ed. 6, p. 115).

Manufactured by Comfort Manufacturing Company, Chicago, Ill. Distributed by Butler Brothers, Chicago, Ill.

Dentex Tooth Paste: Composition: See Zanol Tooth Paste (A.D.R. Ed. 6, p. 121).

Manufactured by the American Products Company, Cincinnati, Ohio.

Arco Tooth Paste: Composition: See Sheffield Dental Cream (A.D.R. Ed. 6, p. 120).

Manufactured by the Sheffield Co., New London, Conn. Distributed by The Bailey Co., Cleveland, Ohio.

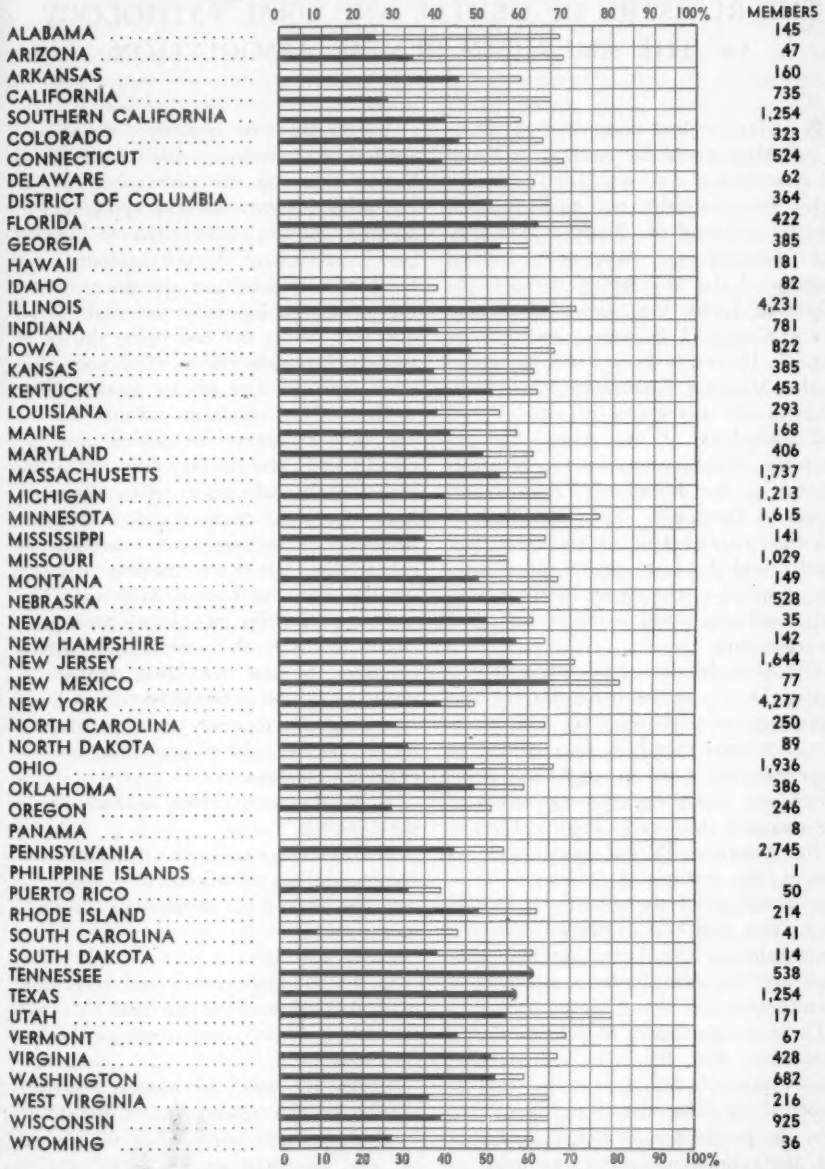
Admission of an article to the list of Accepted Dental Remedies does not imply a recommendation. Information regarding the rules and work of the Council will be sent on request.

HAROLD L. HANSEN, *Secretary.*

*A.D.R. Ed. 6, p. 38.
†A.D.R. Ed. 6, p. 111.

Membership Page

PERCENTAGE OF DUES RECEIVED IN CENTRAL OFFICE AS OF MARCH 31, 1941 AS COMPARED TO 1940 MEMBERSHIP



Percentage based on dental population figures supplied by the State Society Secretaries

1941 percentage. 1940 percentage.

COMMITTEE ON DENTAL MUSEUM

THE REGISTRY OF DENTAL AND ORAL PATHOLOGY OF THE AMERICAN DENTAL ASSOCIATION

IN 1931, the first committee on Dental Museum of the American Dental Association was organized and, in 1932, the committee was made permanent by action of the Board of Trustees. The following year, 1933, at the annual meeting of the association, through the efforts of Lieut. Col. James B. Mann, Dental Corps, U. S. Army, and the late John T. Hanks, of New York, chairman of the Museum Committee, the establishment of a registry of dental and oral pathology at the Army Medical Museum, Washington, D. C., was approved by the Board of Trustees and House of Delegates. The committee at this time consisted of six members, five dentists and the Army dental officer who was attached to the Army Medical Museum and who acted as the secretary of the committee.

The Army Medical Museum in Washington, D. C., is the headquarters and depository of the committee. In 1936, five additional members were added to the committee and, in 1938, the committee was again changed to consist of one member from each Trustee District of the American Dental Association. At present, the committee consists of thirteen members of the American Dental Association and two ex-officio members, the curator of the Army Medical Museum and the dental officer attached to the museum.

There are two main objectives of this committee: first, the collection and the preservation of dental material that is historical or educational or that may show the progress of dentistry, and, second, the collection, preservation and indexing of pathologic specimens.

Under the first objective, the dental section of the museum has a large number of items in the permanent exhibit including instruments and appliances of historic interest; specimens of normal and comparative dental anatomy; orthodontic models, and specimens showing pathologic lesions in the teeth, bones and soft tissue, the last being shown in wet specimens, by means of photographs, wax moulages and plaster models. This section of the museum affords one of the best opportunities for dental lay education in the country because of the large number of visitors to the museum. Last year, more than 100,000 visited the museum. True, we have museums in other cities, but this is the logical place for the National Dental Museum. The master exhibit on the history and progress of dentistry, the outstanding exhibits prepared by the individual dentists or group of dentists, should be placed here, on either a temporary or a permanent basis. We can add to and build up our exhibits as follows:

1. By donations from individuals or their estates.
2. By donations from institutions or commercial organizations.
3. By loans from institutions, individuals or estates.
4. By purchase.
5. By the registration and recording of dental exhibit material held by other museums, schools, organizations or individuals.

Under the last, this dental museum should be the nucleus of a group of similar museums with which we should be able to form an exchange service of museum material and thus assist in

the building up of dental museums throughout the country.

The second objective is definitely the more important in the education of the dentist. It is the Registry of Dental and Oral Pathology. The word "registry" is applied to the facility where case records and material can be centralized for special study. In speaking of a registry of dental and oral pathology, we mean the collection, preservation and indexing of specimens together with pertinent data, clinical record, x-ray films and photographs. The histories should include all diagnostic data, kind of treatment and the results of the treatment.

The purpose of the dental registry is fivefold:

The first natural thing to do is to assist the professional man in his routine work within the oral cavity. We can do this by assisting in or making the histopathologic diagnosis on diseased tissue. The registry has divided the membership of the Association into two groups; one group having available the services of a pathologist, the other not having available such a service. To the first group, we offer our services through their local pathologists. If there is a pathologist who needs assistance in making a diagnosis, the registry is prepared to give it, if necessary, by circulating the data to a group of qualified consultants. For this service, the registry will keep for accession either the tissue material or one or more representative slides with a copy of the case history. As to the other group, who do not have available the service of a pathologist, we will receive the material direct and make a diagnosis either through the medium of the museum staff or, if need be, through a group of consultants. The diagnostic report will be mailed directly to the contributor. For this service, we shall retain for our registry files the tissue material and the case history. If the roentgenograms accompany the case, and they should, and their return is requested, we are to make a copy of the films and return the original.

The second purpose of the registry is as an additional service to the professional men. The registry has prepared sets of lantern slides that may be used by study groups or in the smaller society meetings. A large percentage of dentists are located in communities where dental meetings are few and far between and where it is difficult, owing to the expense involved, to procure suitable speakers. It is to this group that the registry should be of great assistance in their postgraduate educational program as it pertains to dental and oral pathology.

The third purpose of the registry should be to assist in the education of the undergraduates in the dental colleges. This can be accomplished in two ways: first, by assisting the pathologic departments of the schools in the preparation of histopathologic material, and second, by making available to them the accumulated statistics from office files. Realizing that certain of the thirty-nine dental schools are forced to operate on a small and fluctuating budget, the registry should plan to supply, at a small charge, the necessary lantern and microscopic slides required by the several pathologic departments to complete their course in dental pathology.

The fourth and the most important purpose of the registry should be to accumulate a large amount of material on dental and oral pathology on which research and studies can be based; which will add materially to the understanding of dental and oral pathology. This can be accomplished much faster in a centralized national effort than by local organizations.

Fifth is the preparation of the "Atlas of Dental and Oral Pathology" from the accumulated pathologic material in the registry, to be made available to those interested.

There are nine registries at the Army Medical Museum under the support of specialized groups in medicine, including the Registry of Dental and Oral Pathology, sponsored by the American Dental Association. In 1933, when the committee was organized, a few cases on dental and oral pathology were on file in the museum and were the nucleus for the registry. At the end of the first year, there were 375 cases in the file. The last report made at the Cleveland meeting showed 2,113 cases on record. It is apparent that as this work is better understood by the profession, more and more men will cooperate; for it is only the past year that any appreciable number of cases have come from individual practitioners. The report submitted at the Cleveland meeting listed the types of cases on file.

At present, we plan to institute in THE JOURNAL a department in which we shall report every other month the activities of the registry, including interesting cases recently added.

Blanks for registering cases will be supplied upon request. All specimens and requests for biopsy reports should be sent direct to the Curator, Army Medical Museum, War Department, Washington, D. C.

HENRY A. SWANSON, *Chairman*
Committee on National Dental
Museum and Registry
JOSEPH L. BERNIER,
Pathologist to Registry
Dental Corps, U. S. A.

RESEARCH COMMISSION

PALMING AMALGAM

R. C. ANGELL and W. S. Crowell, of the S. S. White Dental Manufacturing Company; K. H. Strader, of the Lee S. Smith and Son Manufacturing Co., and E. W. Skinner and J. R. Jarabak, of Northwestern University, have all demonstrated that palming of dental amalgam in the hand may with time cause excessive expansion.*

Souder, Beall and Schoonover, at the National Bureau of Standards, have attempted, as time permitted, to verify these findings and present the following preliminary report:

1. Clean alloy mixed in a standardized mechanical amalgamator and packed in a steel die without being touched by the hand gave the normal expected, desirable expansion during the first day; then did not change so much as ±0.2 micron per centimeter during any one or all of the following twenty days.

2. Alloy contaminated by contact with the moist palm and fingers (unwashed in two hours) gave near the normal expected expansion during the first day. The expansion, however, continued each day thereafter and, at the end of twelve days, had reached the enormous amount of 100 microns per centimeter.

3. Clean alloy amalgamated and packed as indicated above, except that a drop of saturated sodium chloride solution was added to the alloy before amalgamation, also expanded excessively, in fact almost identically in amount to that of the palmed alloy as reported above.

This confirms the findings of the earlier workers, and suggests the measures necessary to prevent the occurrence

*Unpublished communications.

of this unfavorable phenomenon in practice.

The tests are being continued and may be reported in greater detail in a later communication.

For the present, the Research Commission recommends either the use of (a) a clean mortar and pestle, omitting the palming operation; (b) the mechanical amalgamator (time rated in seconds and accurately controlled for the respective alloy) without palming, or (c) scrupulous cleansing and drying of the hands if the operator persists in the apparently dangerous practice of palming the alloy.

M. D. HUFF, *Chairman,*
DANIEL F. LYNCH, *Secretary,*
Executive Board,
Research Commission.

COMMITTEE ON LEGISLATION

AMERICAN MEDICAL ASSOCIATION FOUND GUILTY OF RESTRAINT OF TRADE

ON Friday, April 4, a jury in the District Court in the District of Columbia rendered a verdict of guilty against the American Medical Association and the District of Columbia Medical Society, on a charge of conspiracy in restraint of trade. In finding only the two societies guilty, the jury exonerated the eighteen individual defendants including Olin West, secretary of the American Medical Association; Morris Fishbein, Editor of *The Journal of the American Medical Association;* R. C. Leland, director of the Bureau of Medical Economics; W. C. Woodward, director of the Bureau of Medical Legislation; W. D. Cutter, secretary of the Council on Medical Education and Hospitals, and other physicians, mostly District of Columbia practitioners.

The government charged that the two organizations and the individual physicians entered into a conspiracy in restraint of trade and interfered with operations of the Group Health Association, a cooperative organization rendering medical service to government employes in exchange for a monthly fee paid in advance.

The trial was started February 5 and completed April 4, just two months later. The jury deliberated about eleven hours before rendering its verdict.

Justice James M. Proctor instructed the jury to weigh the evidence against each defendant separately "to determine whether it does prove beyond a reasonable doubt that such defendant was a party to the conspiracy." He stated that the individual defendants had the right to refuse to consult with any physicians that they did not wish to consult with and that they had a right to "legitimate criticism, argument and persuasion, however persistent and severe, either separately or by collective effort; through the medium of speech, letters or print."

The verdict leaves the interesting situation of the association as a body being guilty of a conspiracy to restrain trade, but none of its agents who perform the work of the Association being guilty. Whether any further determination will be made in the case remains to be seen. Justice Proctor has not yet ruled upon several motions which have been made nor has he imposed sentence on the two associations. The penalty will presumably only involve fines. Attempts to appeal the case will undoubtedly be made.

LEGAL ANGLES TO DENTAL OFFICE BUSINESS TANGLES

By LESLIE CHILDS, Indianapolis, Ind.

WHEN a dentist rents or leases an office, his rights and liabilities in connection therewith will of course be measured by the terms of the contract. He will, however, generally speaking, be entitled to the free and unobstructed use of the space so acquired, and any unwarranted interferences with such use by his landlord may entitle him to damages.

So too, in measuring damages in cases of this kind, the nature of the dentist's calling and the effect of interference with his normal contact with his clientele may be taken into account. The application of this rule is illustrated in Sweeney vs. Meyers et al., 199 Minn. 21, 270 N. W. 906.

DENTIST'S OFFICE PADLOCKED

Here, the plaintiff, a dentist, rented an office in a building owned and managed by the defendants. On August 29, the plaintiff went to his office in the morning. About 8:30, he left, intending to return in a little while. When he did return, he found the door padlocked, and it remained padlocked until September 14, a period of two weeks.

This padlocking of the plaintiff's office arose out of the mistaken belief of the defendants that the plaintiff was behind with his rent. The plaintiff sued for damages, and a jury awarded him $300 actual and $600 exemplary damages. From judgment thereon, the defendants appealed, the principal issue being the reasonableness of the damages. In passing upon this point, in respect to the actual damages awarded, the court said:

> From September 13, the time when the plaintiff was able to reopen his office, until the end of that month, he took in cash totaling $195. Taking this into account, and considering the fact that many people called during the period the office was closed, and also that there was evidence from which it could have been found that the plaintiff lost $245 on three definite jobs, it does not seem that the defendants' contention that the verdict of $300 could have been reached only as the result of conjecture is tenable. . . .
>
> It is claimed that the plaintiff should have done something to mitigate the damage. His professional equipment was locked securely out of his reach. It is difficult to see just what he could have done. To have purchased more equipment or secured another office would only have increased the damage.

Then turning to the fairness of the award of exemplary damages, namely $600, and in affirming the judgment, the court said:

> The exemplary damages are claimed to be excessive. The plaintiff had practiced in the city of Alexandria for about fifteen years. He had established a good reputation. Undoubtedly, a patient's confidence, an invaluable asset to a professional man, would be shaken by the finding of a padlock on the door of his dentist's office.
>
> The amount of damages in a case such as this cannot be determined by any established rule. . . . It is a matter that is "emphatically for the jury." . . . Unless the verdict of the jury is so clearly excessive that it is apparent the jurors were actuated by passion or prejudice, it will not be disturbed. . . . In view of the business loss and embarrassment suffered by plaintiff, it cannot be held as a matter of law that the amount awarded was excessive. Affirmed.

So too, in Winchester vs. O'Brien et al., 266 Mass. 33, 164 N. E. 807, the court passed upon the right of a dentist to damages for wrongful interference by his landlord with his use of his office. The facts were as follows.

LANDLORDS REMODEL BUILDING

The plaintiff, a dentist, had a three-

year lease upon his office suite. About three months before this lease expired, the defendants, landlords, undertook to remodel the building. This involved tearing out partitions and putting in new ones, a change in the elevator and rearrangement of the plumbing and other fixtures. Much noise resulted. Dirt and rubbish accumulated in the hallways; which made it difficult for the plaintiff's patients to reach his office at times.

The hot water tank was removed. Upon occasion, the electricity in the plaintiff's office was shut off; which increased his difficulty in operating. The situation culminated in the plaintiff's suing for damages.

In defense, the defendants appear to have mainly relied upon the claim that the remodeling work had been carried on in a reasonable and proper manner. Further, the defendants pointed out that they had in no way invaded the plaintiff's office. The plaintiff was awarded $650 damages. In affirming the verdict on appeal, the court reasoned:

> If a landlord authorizes acts to be done which cause substantial injury to the tenant in the peaceful enjoyment of the demised premises and such a result is the natural and probable consequences of the acts so authorized, the landlord is liable therefor. . . .
>
> Even though the work was carried on in a reasonable and proper manner and entirely outside the rooms leased, injury was done to the property and appliances used in those rooms; there were interruptions of the electric and water service therein; the plaintiff's right of access was made more difficult; his property was injured, and he suffered a loss of income in business. The finding that the work was done outside and was properly done is not a controlling circumstance. . . .
>
> It is evident from the facts found that there has been a substantial and continued interference with the plaintiff's beneficial enjoyment of the leased premises and appurtenant rights by the acts done or authorized by the defendants. . . . This suit falls within the class of cases where a tenant may remain in possession and seek relief against the landlord for wrongful interference with his rights as a tenant because the acts are wrongful invasions of such rights. . . . Decree affirmed with costs.

And, too, it will be conceded that a telephone is a necessity in the operation of a dental office. The question then of the liability of a telephone company for negligence in the matter of giving a dentist service is of interest. One phase of this subject was up for consideration in Stein vs. Diamond State Telephone Co., 34 Del. 185, 146 Atl. 737, under the following facts.

MIXUP IN LISTING DENTIST IN TELEPHONE DIRECTORY

The plaintiff, a dentist, had been practicing with another dentist under a trade name, though their individual names were also listed in the telephone directory at the same address. The plaintiff moved his office to another location, where he had a telephone installed under a different number, but the telephone company through some mistake continued to carry his name at the old address. The plaintiff protested this double listing, and the company agreed to do what it could to remedy the matter by transmitting calls made to him at the old address.

Following this, plaintiff again moved his office and of course had a telephone installed, and the telephone company, through error, failed to give the plaintiff any listing whatever but continued to carry his name at his first address, whereupon he sued the telephone company for damages.

Since the acts of the telephone company were not malicious, but merely negligent, the court declined to allow the assessment of punitive damages. It did, however, allow actual damages to be awarded by the jury, and in closing its charge to the latter had this to say:

> Measured by these standards [standards of damages], my conclusion is that, while

the acts of the defendant company were unwarranted and in violation of a duty owed by it to the plaintiff, they were, nevertheless, merely negligent acts; or, at most, so far as the double listing . . . is concerned, acts which they thought they had the right to do, and not malicious acts for which they could be punished by the award of punitive or exemplary damages. . . .

You are, therefore, directed to return a verdict for the plaintiff. The amount of such verdict is for you to determine; but it must be based on the actual damages suffered by the plaintiff from the acts of the defendant as the same appeared from the evidence produced before you. Verdict for the plaintiff for $500.

LOSS OF PERSONAL PROPERTY IN DENTAL OFFICE

Somewhat germane to the subject is the question of a dentist's liability for the loss of a patient's personal property while in his office. The point was litigated in Webster vs. Lone, 212 N. Y. S. 298, and while no definite conclusion was reached on the facts, the language of the court leaves little doubt of a dentist's liability under similar circumstances.

Here, the plaintiff, a patient of the defendant, dentist, left her fur coat in the defendant's reception room while receiving dental services. The coat was lost and the plaintiff brought suit against the defendant for its value. The trial court dismissed the case. The plaintiff appealed, and the higher court, in reversing the judgment, reasoned as follows:

The plaintiff removed her fur coat in the reception room of the defendant, a dentist, and left it there while she was undergoing treatment. On her return to the reception room later, her coat could not be found. While the plaintiff was in the dentist's chair, her coat was not visible, and it is evident that she could not be said to have continued to keep it in her possession. . . .

In fact, the existence of the reception room and the absence of any closet or other appropriate place to deposit wraps indicated that the plaintiff's action was wholly expected. She testified that it had been her custom to so place her coat on other occasions when she had visited the dentist's office, and either the dentist himself or the attendant must have known of this practice.

Furthermore, we think we may take judicial notice of the fact that the patients of a dentist are not placed in a dental chair for treatment while they have their overcoats or wraps on. It seems clear, therefore, that the defendant undertook voluntary custody of the coat as an accommodation to his patient, and as part of the service for which he was being paid. . . . Judgment reversed, and a new trial ordered, with $30 costs to appellant [plaintiff] to abide the event.

The foregoing cases were of course decided upon their particular facts and circumstances, and in no way announce any hard and fast rules of law. However, this in no way detracts from their value as an instructive cross-section of dental law dealing with the subject of legal angles to dental office business tangles.

1520 East Tenth Street.

COUNCIL ON DENTAL EDUCATION

THE DENTAL STUDENTS' REGISTER

THE series of statistical tables issued annually by the Council on Dental Education under the caption of the Dental Students' Register presents evidence of interesting trends in dental education and licensure. The several tables are compiled as of October 15, 1940.

Table 1, dealing with enrolment in the 39 dental schools in the United States, shows the following enrolments in different groups: undergraduates in the regular four-year course, 7,720; specials, 25; graduate students enrolled in courses leading to an advanced degree, 101; postgraduates enrolled in special courses not leading to an advanced degree, 149; dental hygiene students, 316. The grand total is 8,311, of which 7,902 are men and 409 are women. The women are distributed as follows: in the regular four-year course, 88; in dental hygiene, 316; in special courses, 5. The undergraduate enrolment by classes stands as follows: first year, 2,305; second year, 1,973; third year, 1,841; fourth year, 1,601.

By graduation time in June this year it seems likely, under normal conditions, that the fourth year class number 1,601 on October 15, 1940, will have been reduced to about 1,550. This will be the smallest graduating class since 1920 and with one other exception the smallest since 1896. There were 1,519 graduates in 1906 and 1,432 in 1896. The peak was reached in 1919 when there were 46 dental schools in operation with 3,587 graduates. The drop to 906 graduates in 1920 was due to the falling off of entering students during the Great War. After the War, the highest number of graduates was 3,422 in 1924. During the decade 1930-1940 there was a 22 per cent decrease in the number of graduates over the previous decade. The marked drop in the number of graduates in 1941 is due to an accumulation of definite causes, in part to the general economic situation and in part to the advancing of requirements in recent years.

It has been estimated by competent authority that about 2,250 dentists are eliminated from active practice each year by death, retirement and other causes. The situation with which the profession and the public are confronted this year is a shortage of at least 750 new practitioners to maintain the present ratio of dentists to population. When the number of dentists likely to be called into military training and service is also taken into account, it will readily be seen that the recruiting of more well-qualified students to enter upon the study of dentistry is of very great importance.

Table 2 shows a recapitulation of the undergraduate enrolment since 1932 with a gain of 212 over 1932 and a gain of 313 over 1939. Present enrolments per school vary from 41 to 551, with an average of 198.

Table 3 deals with the predental college training of the 7,720 undergraduates enrolled in regular courses. Only 82 of the entire enrolment had less than 2 years of predental college training and they are hold-overs who entered dental schools before the present two year requirement became generally effective. The predental training of the remaining 7,138 stands as follows: 2 years, 3,875; 3 years, 1,338; 4 years without a bachelor's degree, 223; with a bachelor's degree, 2,090; with other degree, 112. Thus almost half of the entire enrolment entered upon dental study with 3 or more years of liberal arts college training. This table also shows separate data for the first year students entering dental schools

in September 1940. There were 2,305 such students with predental training as follows: 2 years, 1,201; 3 years, 421; 4 years without a bachelor's degree, 64; with a bachelor's degree, 601; with other degree, 18.

The Curriculum Survey Report recommended in 1935 that the minimum requirement for admission to a dental school be fixed at two years of liberal arts college training with certain specified hours in English and in biology, chemistry and physics. It is interesting to note that all the thirty-nine schools in the United States are now following the recommendation of the Report and that nearly half the students now enrolled have had considerably more than the recommended preliminary training. The Council on Dental Education, which continues the present requirements in substance, prescribes that entering students shall come from approved liberal arts colleges and puts added emphasis on the quality of the applicant's scholarship and his personal fitness to undertake the study of dentistry from the standpoint of health, character, professional instinct and aptitude.

Table 4 gives the predental college training of the 1,757 students who graduated from the 39 dental schools in the United States in the year ending July 1, 1940, as follows: with less than 2 years, 438; with 2 years, 609; with 3 years, 223; with 4 years without a bachelor's degree, 42; with a bachelor's degree, 394; with other degree, 51.

Table 5 gives the record of graduates with predental college training of the bachelor's degree or beyond from 1935 to 1940, inclusive. There were 320 in 1935 and 445 in 1940.

Table 6 shows the distribution of the 7,720 undergraduates enrolled in the 39 dental schools of the United States by the states, territories and foreign countries from which they come. There are students from every state in the Union, ranging from 5 from Nevada to 1,804 from New York. Of the 1,804 from New York, 847 are enrolled in the three dental schools in the State of New York and 957 are enrolled in dental schools outside of the state. There are 72 students from U. S. possessions, 34 from Canada, and 80 from other foreign countries.

Table 7 gives data concerning the 2,400 teachers in the 39 dental schools in the United States. Of this number, 641 are engaged on full time and 1,759 on part time. In the total number, 711 hold a bachelor's degree, 307, a master's degree and 222, the degree of doctor of philosophy and 240 some other academic degree. The professional degree of M.D. is held by 424 and the D.D.S. or D.M.D. by 1,797. Of the 1,797 who hold a dental degree, 1,410 are teaching in the dental school from which they graduated and 387 in other schools.

Table 8 shows the tuition and fee charges year by year in each school and the opening and closing dates of the academic year. The range of such charges for the full course runs from $726.00 to $2,224.00.

Table 9 shows the number enrolled in the first year classes in the 39 dental schools of the United States as of October 15, 1940, the number accepted who did not matriculate and the number rejected.

Table 10 presents the results of dental licensing examinations by the 49 licensing boards in the United States for the calendar year 1939. This table shows that 2,744 were examined, 2,196 were passed and 548 or 20 per cent failed. Seven state boards passed all applicants and fifteen boards failed 30% or more.

TABLE 1.—TOTAL ENROLMENT IN THE DENTAL SCHOOLS OF THE UNITED STATES AS OF OCTOBER 15, 1940

SCHOOL OR COLLEGE	UNDERGRADUATES								OTHER STUDENTS						ALL STUDENTS		
	Freshman	Sophomores	Juniors	Seniors	Men	Women	Total	Dental Hygienists	Specials	Graduate	Post Grad.	Men	Women	Total	Men	Women	Total
California																	
College of Physicians & Surgeons	43	43	35	30	145	6	151	–	–	–	–	–	–	–	145	6	151
University of California	62	35	42	29	166	2	168	10	1	–	3	4	10	14	170	12	182
University of Southern California	119	85	57	77	335	3	338	5	–	12	–	12	5	17	347	8	355
District of Columbia																	
Georgetown University	56	44	42	41	183	–	183	–	–	–	–	–	–	–	183	–	183
Howard University	24	22	15	11	71	1	72	8	–	–	–	–	8	8	71	9	80
Georgia																	
Atlanta-Southern Dental College	118	77	72	52	314	5	319	–	–	–	–	–	–	–	314	5	319
Illinois																	
Loyola University, Chicago	92	75	58	44	269	–	269	–	–	5	–	5	–	5	274	–	274
Northwestern University	72	62	70	91	290	5	295	16	–	27	4	31	16	47	321	21	342
University of Illinois	61	67	50	46	221	3	224	–	2	14	1	14	3	17	235	6	241
Indiana																	
Indiana University	47	29	19	18	113	–	113	–	–	–	–	–	–	–	113	–	113
Iowa																	
State University of Iowa	37	41	18	16	112	–	112	–	1	3	–	4	–	4	116	–	116
Kentucky																	
University of Louisville	47	50	39	41	175	2	177	–	–	–	–	–	–	–	175	2	177
Louisiana																	
Loyola University, New Orleans	45	38	43	28	154	–	154	–	–	–	–	–	–	–	154	–	154
Maryland																	
University of Maryland	86	85	64	75	308	2	310	–	1	–	–	–	1	1	308	3	311
Massachusetts																	
Harvard University	40	40	33	33	146	–	146	–	4	–	5	9	–	9	155	–	155
Tufts College	74	64	56	63	254	3	257	–	1	–	–	1	–	1	255	3	258
Michigan																	
University of Detroit	22	24	32	28	105	1	106	–	1	–	–	1	–	1	106	1	107
University of Michigan	42	49	32	35	154	4	158	22	1	28	77	106	22	128	260	26	286
Minnesota																	
University of Minnesota	64	62	62	9	195	2	197	103	1	7	–	8	103	111	203	105	308
Missouri																	
Kansas City-Western Dental College	91	67	53	29	240	–	240	–	–	–	–	–	–	–	240	–	240
St. Louis University	54	30	58	25	167	–	167	–	–	–	–	–	–	–	167	–	167
Washington University	16	22	24	28	87	3	90	–	2	–	–	2	–	2	89	3	92
Nebraska																	
Creighton University	18	24	15	19	76	–	76	–	–	–	–	–	–	–	76	–	76
University of Nebraska	12	14	11	11	48	–	48	–	–	–	–	–	–	–	48	–	48
New York																	
Columbia University	60	56	47	52	210	5	215	41	–	–	23	23	41	64	233	46	279
New York University	157	142	129	123	550	1	551	–	–	–	21	21	–	21	571	1	572
University of Buffalo	56	–	44	42	142	–	142	–	–	–	–	–	–	–	142	–	142
Ohio																	
Ohio State University	62	61	55	44	221	1	222	–	–	–	2	2	–	2	223	1	224
Western Reserve University	41	42	34	44	159	2	161	–	–	–	–	–	–	–	159	2	161
Oregon																	
North Pacific College of Oregon	55	55	37	24	169	2	171	15	3	–	3	6	15	21	175	17	192
Pennsylvania																	
Temple University	116	92	135	36	430	9	439	28	3	–	–	3	28	31	433	37	470
University of Pennsylvania	116	94	98	117	420	5	425	36	–	–	3	3	36	39	423	41	464
University of Pittsburgh	98	82	73	46	286	11	297	–	–	5	7	12	–	12	298	11	309
Tennessee																	
Meharry Medical College	12	9	12	8	40	1	41	–	1	–	–	–	1	1	40	2	42
University of Tennessee	33	29	28	15	104	1	105	17	2	–	–	2	17	19	106	18	124
Texas																	
Baylor University	38	47	36	25	144	–	144	–	–	–	–	–	–	–	144	–	144
Texas Dental College	34	23	19	11	85	2	87	–	1	–	–	1	–	1	86	2	88
Virginia																	
Medical College of Virginia	33	37	30	35	134	1	135	–	–	–	–	–	–	–	134	1	135
Wisconsin																	
Marquette University	56	55	64	40	210	5	215	15	–	–	–	–	15	15	210	20	230
TOTALS - 1940	2305	1973	1841	1601	7632	88	7720	318	25	101	149	270	321	591	7902	409	8311

TABLE 2.—RECAPITULATION OF UNDERGRADUATE ENROLMENT IN THE DENTAL SCHOOLS OF THE UNITED STATES, 1932-1940 INCLUSIVE

SCHOOL OR COLLEGE	1932-1933	1933-1934	1934-1935	1935-1936	1936-1937	1937-1938	1938-1939	1939-1940	1940-1941
California									
College of Physicians & Surgeons	137	136	142	136	141	135	151	147	151
University of California	138	128	140	142	159	152	179	163	168
University of Southern California	315	282	286	298	348	327	297	309	338
District of Columbia									
Georgetown University	258	208	193	165	124	155	166	165	183
Howard University	37	38	35	38	37	40	45	58	72
Georgia									
Atlanta-Southern Dental College	294	294	284	301	326	299	313	318	319
Illinois									
Loyola University, Chicago	382	321	293	272	305	269	264	259	269
Northwestern University	335	347	322	341	325	326	302	286	295
University of Illinois	91	97	125	146	162	196	220	222	224
Indiana									
Indiana University	156	152	166	163	188	152	137	118	113
Iowa									
State University of Iowa	143	141	145	167	186	145	118	117	112
Kentucky									
University of Louisville	120	121	111	122	107	104	139	163	177
Louisiana									
Loyola University, New Orleans	142	147	133	134	165	166	177	167	154
Maryland									
University of Maryland	354	324	352	294	219	222	216	255	310
Massachusetts									
Harvard University	122	122	127	151	145	152	154	154	146
Tufts College	286	283	258	257	240	240	249	245	257
Michigan									
University of Detroit	46	86	127	101	95	100	114	112	106
University of Michigan	183	146	151	161	150	135	153	162	158
Minnesota									
University of Minnesota	220	214	275	293	302	283	242	208	197
Missouri									
Kansas City-Western Dental College	229	222	231	238	241	203	207	204	240
St. Louis University	168	159	154	178	200	188	170	150	167
Washington University	181	161	139	131	122	116	120	123	90
Nebraska									
Creighton University	98	96	92	96	77	76	71	75	76
University of Nebraska	92	72	66	73	76	67	62	55	48
New York									
Columbia University	178	178	183	179	196	201	198	203	215
New York University	499	504	516	518	532	540	535	533	551
University of Buffalo	132	137	131	123	117	130	140	141	142
Ohio									
Ohio State University	191	198	198	207	202	193	202	209	222
Western Reserve University	120	107	116	121	124	132	140	162	161
Oregon									
North Pacific College of Oregon	198	178	153	157	191	158	167	182	171
Pennsylvania									
Temple University	507	500	510	507	457	430	437	405	430
University of Pennsylvania	337	326	324	341	382	401	417	414	425
University of Pittsburgh	235	186	194	187	163	127	159	220	297
Tennessee									
Meharry Medical College	27	20	22	25	21	33	34	33	41
University of Tennessee	121	113	93	87	113	108	111	109	105
Texas									
Baylor University	106	102	107	110	125	128	134	151	144
Texas Dental College	53	47	59	65	79	80	81	81	87
Virginia									
Medical College of Virginia	103	99	90	110	112	124	136	137	135
Wisconsin									
Marquette University	174	168	142	171	145	154	175	192	215
ANNUAL TOTALS	7508	7160	7175	7306	7397	7184	7331	7407	7720
ANNUAL AVERAGE PER SCHOOL	193	184	184	187	189	184	188	190	198

TABLE 3.—PREDENTAL COLLEGE TRAINING OF UNDERGRADUATES IN REGULAR COURSE IN THE DENTAL SCHOOLS OF THE UNITED STATES AS OF OCTOBER 15, 1940

SCHOOL OR COLLEGE	ALL UNDERGRADUATES							FRESHMEN					
	Less Than 2 Years	2 Years	3 Years	4 Years Without Degree	Bachelor's Degree	Beyond Bachelor's Degree	Total	2 Years	3 Years	4 Years Without Degree	Bachelor's Degree	Beyond Bachelor's Degree	Total
California													
College of Physicians & Surgeons	3	105	23	1	12	7	151	32	4	–	4	3	43
University of California	5	96	30	8	27	2	168	37	12	5	7	1	62
University of Southern California	29	230	24	8	46	1	338	94	10	–	14	1	119
District of Columbia													
Georgetown University	–	71	37	14	59	2	183	26	11	1	18	–	56
Howard University	–	16	9	1	43	3	72	8	5	–	10	1	24
Georgia													
Atlanta-Southern Dental College	–	190	42	19	66	2	319	77	14	7	20	–	118
Illinois													
Loyola University, Chicago	16	195	25	4	27	2	269	75	6	1	10	–	92
Northwestern University	–	133	72	17	72	1	295	30	15	2	24	1	72
University of Illinois	–	143	40	5	36	–	224	37	9	1	14	–	61
Indiana													
Indiana University	–	64	24	5	20	–	113	23	11	3	10	–	47
Iowa													
State University of Iowa	5	67	18	1	20	1	112	25	6	–	6	–	37
Kentucky													
University of Louisville	–	62	50	23	40	2	177	17	17	3	10	–	47
Louisiana													
Loyola University, New Orleans	2	101	18	5	28	–	154	27	5	1	12	–	45
Maryland													
University of Maryland	–	189	37	10	74	–	310	46	17	4	19	–	86
Massachusetts													
Harvard University	1	62	22	2	58	1	146	16	8	–	15	1	40
Tufts College	–	116	38	6	96	1	257	33	12	3	26	–	74
Michigan													
University of Detroit	–	75	9	3	19	–	106	16	2	1	3	–	22
University of Michigan	–	85	14	–	49	10	158	21	10	–	11	–	42
Minnesota													
University of Minnesota	–	127	40	4	19	7	197	42	17	2	2	1	64
Missouri													
Kansas City-Western Dental College	–	170	27	3	40	–	240	66	10	2	13	–	91
St. Louis University	–	94	29	9	33	2	167	32	14	–	8	–	54
Washington University	5	44	20	–	18	3	90	6	3	–	6	1	16
Nebraska													
Creighton University	5	50	11	2	7	1	76	11	4	1	1	1	18
University of Nebraska	3	19	12	4	10	–	48	6	4	–	2	–	12
New York													
Columbia University	–	–	62	6	138	9	215	–	16	2	41	1	60
New York University	–	34	167	–	348	2	551	12	43	–	101	1	157
University of Buffalo	–	65	23	2	47	5	142	26	11	–	19	–	56
Ohio													
The Ohio State University	–	94	63	7	57	1	222	27	19	3	13	–	62
Western Reserve University	–	67	42	5	47	–	161	21	10	2	8	–	41
Oregon													
North Pacific College of Oregon	–	112	21	1	37	–	171	38	9	1	7	–	55
Pennsylvania													
Temple University	–	312	42	–	85	–	439	64	23	–	28	1	116
University of Pennsylvania	–	152	87	5	169	12	425	44	26	1	43	2	116
University of Pittsburgh	–	157	39	6	65	30	297	56	12	3	24	1	96
Tennessee													
Meharry Medical College	–	10	2	4	25	–	41	3	1	1	7	–	12
University of Tennessee	3	48	20	8	25	1	105	14	6	4	9	–	33
Texas													
Baylor University	3	78	26	14	23	–	144	22	1	5	8	–	36
Texas Dental College	–	58	9	4	13	3	87	23	4	2	5	–	34
Virginia													
Medical College of Virginia	2	64	26	3	40	–	135	16	7	–	10	–	33
Wisconsin													
Marquette University	–	120	38	4	52	1	215	32	7	3	13	1	56
TOTALS	82	3875	1338	223	2090	112	7720	1201	421	64	601	18	2305

TABLE 4.—PREDENTAL COLLEGE TRAINING OF GRADUATES OF THE DENTAL SCHOOLS IN THE UNITED STATES FOR YEAR ENDING JULY 1, 1940

SCHOOL OR COLLEGE	Less Than 2 Years	2 Years	3 Years	4 Years Without Degree	Bachelor's Degree	Beyond Bachelor's Degree	Total	Per Cent With Bachelor's or other Degree	No. Graduating in Combined Course 6 Yrs.	No. Graduating in Combined Course 7 Yrs.
California										
College of Physicians & Surgeons	12	15	–	–	8	1	36	25	4	–
University of California	14	17	3	–	3	1	38	10	24	–
University of Southern California	45	15	1	–	10	–	71	14	1	–
District of Columbia										
Georgetown University	–	11	4	1	8	1	25	36	–	–
Howard University	–	1	1	1	3	1	7	57	–	–
Georgia										
Atlanta-Southern Dental College	65	26	4	1	13	1	110	13	–	–
Illinois										
Loyola University - Chicago	60	12	3	–	2	3	80	6	–	1
Northwestern University	4	30	11	3	10	17	75	36	–	–
University of Illinois	–	40	6	–	12	–	58	21	31	–
Indiana										
Indiana University	21	16	4	2	1	–	44	2	–	–
Iowa										
The State University of Iowa	26	8	4	–	–	–	38	–	–	–
Kentucky										
University of Louisville	–	6	12	–	10	–	28	36	–	–
Louisiana										
Loyola University, New Orleans	31	9	3	–	2	1	46	6	–	–
Maryland										
University of Maryland	–	7	1	2	5	–	15	33	–	–
Massachusetts										
Harvard University	–	14	4	–	20	1	39	54	–	–
Tufts College	–	22	5	2	28	–	57	50	–	1
Michigan										
University of Detroit	–	18	3	–	2	–	23	9	–	–
University of Michigan	–	18	8	–	9	–	35	26	–	2
Minnesota										
University of Minnesota	–	54	14	–	5	2	75	9	–	–
Missouri										
Kansas City-Western Dental College	28	11	2	1	2	–	44	5	–	–
St. Louis University	18	10	3	–	1	–	32	3	–	–
Washington University	21	8	2	–	5	1	37	16	3	–
Nebraska										
Creighton University	8	2	1	–	2	–	13	15	–	–
University of Nebraska	8	5	–	–	5	–	18	28	2	1
New York										
Columbia University	–	–	14	–	28	1	44	61	–	11
New York University	–	11	46	–	63	1	121	53	–	–
University of Buffalo	–	16	6	–	24	4	50	56	–	–
Ohio										
The Ohio State University	–	27	5	3	7	–	42	17	2	–
Western Reserve University	–	12	6	–	16	1	35	49	8	3
Oregon										
North Pacific College of Oregon	30	20	3	2	7	–	62	11	4	–
Pennsylvania										
Temple University	13	52	9	2	8	–	84	9	–	–
University of Pennsylvania	–	36	12	2	34	6	90	44	–	3
University of Pittsburgh	–	21	1	1	3	7	33	30	14	–
Tennessee										
Meharry Medical College	–	–	2	–	3	–	5	60	–	–
University of Tennessee	–	12	3	9	10	1	35	31	–	–
Texas										
Baylor University	5	11	5	9	5	–	35	14	5	–
The Texas Dental College	22	4	2	–	3	–	31	10	–	–
Virginia										
Medical College of Virginia	7	5	6	–	5	–	23	21	–	–
Wisconsin										
Marquette University	–	7	4	–	12	–	23	52	3	–
TOTALS	438	609	223	42	394	51	1757	25	101	22

TABLE 5.—GRADUATES WITH PREDENTAL COLLEGE TRAINING OF BACHELOR'S DEGREE OR BEYOND IN THE DENTAL SCHOOLS OF THE UNITED STATES, 1935 TO 1940 INCLUSIVE

SCHOOL OR COLLEGE	1935		1936		1937		1938		1939		1940		
	Total No.	No. With Degree	Total No.	No. With Degree	Total No.	No. With Degree	Total No.	No. With Degree	Total No.	No. With Degree	Total No.	No. With Degree	Per Cent With Degree
California													
College of Physicians & Surgeons	35	3	22	8	33	18	36	10	18	3	36	9	25
University of California	36	10	32	11	32	12	30	21	37	17	38	4	10
University of Southern California	67	31	59	12	54	10	72	20	65	16	71	10	14
District of Columbia													
Georgetown University	65	3	73	7	18	2	29	9	45	12	25	9	36
Howard University	3	3	6	2	11	1	7	1	7	4	7	4	57
Georgia													
Atlanta-Southern Dental College	70	3	75	5	64	5	64	3	69	11	110	14	13
Illinois													
Loyola University - Chicago	87	-	71	4	60	-	64	-	75	7	80	5	6
Northwestern University	91	27	91	23	85	20	99	30	108	13	75	27	36
University of Illinois	23	12	22	18	21	19	29	25	37	31	58	12	21
Indiana													
Indiana University	44	2	28	3	45	4	43	5	46	2	44	1	2
Iowa													
State University of Iowa	29	2	22	3	44	1	46	2	45	1	38	-	-
Kentucky													
University of Louisville	33	9	35	5	40	8	8	1	27	8	28	10	36
Louisiana													
Loyola University - New Orleans	29	-	29	2	36	1	38	2	35	6	46	3	6
Maryland													
University of Maryland	86	2	79	1	73	3	66	4	63	4	15	5	33
Massachusetts													
Harvard University	23	6	39	17	24	11	33	13	29	10	39	21	54
Tufts College	59	11	66	8	64	13	51	17	64	24	57	28	50
Michigan													
University of Detroit	33	12	35	8	37	11	14	3	16	-	23	2	9
University of Michigan	30	8	46	12	49	8	24	5	33	7	35	9	26
Minnesota													
University of Minnesota	74	2	75	14	87	-	92	9	100	13	75	7	9
Missouri													
Kansas City-Western Dental College	63	5	50	3	44	10	60	9	67	8	44	2	5
St. Louis University	31	-	38	1	38	5	63	12	53	6	32	1	3
Washington University	41	2	45	3	25	1	31	3	20	1	37	6	16
Nebraska													
Creighton University	26	2	20	1	28	-	18	-	24	4	13	2	15
University of Nebraska	18	1	17	3	11	-	19	2	18	4	18	5	28
New York													
Columbia University	53	34	34	28	45	35	46	44	51	47	44	29	61
New York University	119	32	128	25	117	37	121	34	128	57	121	64	53
University of Buffalo	36	5	39	7	35	13	29	9	34	17	50	28	56
Ohio													
Ohio State University	54	10	45	3	58	6	40	3	55	-	42	7	17
Western Reserve University	27	12	25	10	23	13	28	13	28	17	35	17	49
Oregon													
North Pacific College of Oregon	45	3	35	4	36	5	35	4	39	-	62	7	11
Pennsylvania													
Temple University	120	8	110	6	127	-	120	3	114	3	84	8	9
University of Pennsylvania	93	17	75	9	79	19	72	19	98	27	90	40	44
University of Pittsburgh	60	21	48	18	70	34	40	21	20	6	33	10	30
Tennessee													
Meharry Medical College	4	2	6	5	4	3	5	1	5	1	5	3	60
University of Tennessee	32	2	21	1	20	2	21	3	20	-	35	11	31
Texas													
Baylor University	25	2	23	2	26	4	32	1	27	3	35	5	14
Texas Dental College	12	1	10	-	11	1	19	1	17	-	31	3	10
Virginia													
Medical College of Virginia	15	1	23	3	22	1	16	2	31	6	23	5	21
Wisconsin													
Marquette University	49	14	39	14	43	16	44	19	25	6	23	12	52
TOTALS	1840	320	1736	309	1739	352	1704	383	1794	402	1757	445	25

TABLE 6.—DISTRIBUTION OF UNDERGRADUATE STUDENTS BY STATES, TERRITORIES AND FOREIGN COUNTRIES IN THE DENTAL SCHOOLS OF THE UNITED STATES AS OF OCTOBER 15, 1940

	Alabama	Arizona	Arkansas	California	Colorado	Connecticut	Delaware	Dist. of Col.	Florida	Georgia	Idaho	Illinois	Indiana	Iowa	Kansas	Kentucky	Louisiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Mississippi	Missouri
California																								
College of Physicians & Surgeons	-	1	-	121	1	-	-	-	-	-	2	1	-	1	2	-	-	-	-	-	-	-	-	-
University of California	-	-	-	148	1	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	2	-	-	-
University of Southern California	-	12	-	187	11	1	-	-	1	-	9	4	1	1	2	-	-	-	-	1	5	2	1	2
District of Columbia																								
Georgetown University	-	-	-	-	-	14	-	43	1	-	-	-	-	-	-	-	-	3	3	10	-	-	-	-
Howard University	6	-	1	-	-	-	-	4	4	1	-	-	1	-	-	-	-	-	3	-	-	-	1	-
Georgia																								
Atlanta-Southern Dental College	41	-	-	3	1	4	1	5	42	54	-	-	2	-	-	1	2	-	4	4	3	-	9	-
Illinois																								1
Loyola University, Chicago	-	-	-	-	-	5	-	-	1	-	1	179	10	1	-	2	-	-	-	2	16	3	-	1
Northwestern University	3	1	2	1	4	1	-	5	8	2	-	102	6	3	2	3	2	2	-	6	20	1	5	1
University of Illinois	-	-	-	1	-	-	-	-	-	-	-	132	-	-	1	-	-	-	-	-	3	-	-	-
Indiana																								
Indiana University	-	-	-	1	-	10	-	-	-	-	-	2	76	-	-	4	-	-	-	1	2	-	-	-
Iowa																								2
State University of Iowa	-	-	-	-	1	-	-	-	-	-	-	-	-	90	-	1	-	1	-	1	-	-	-	1
Kentucky																								
University of Louisville	6	-	2	-	-	1	-	-	6	-	-	-	3	-	-	82	-	5	-	2	-	-	-	1
Louisiana																								1
Loyola University, New Orleans	7	-	2	-	-	3	-	-	6	-	-	-	1	-	-	1	94	-	-	1	1	-	10	-
Maryland																								
University of Maryland	1	-	-	-	-	20	3	2	-	-	-	-	-	-	-	-	-	2	63	7	-	-	-	-
Massachusetts																								
Harvard University	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	13	-	73	-	-	-	-
Tufts College	-	-	-	-	-	29	-	-	-	-	-	-	-	-	-	-	-	9	-	141	-	-	-	-
Michigan																								
University of Detroit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	101	-	-	-
University of Michigan	-	-	-	-	1	1	-	-	-	-	-	1	-	-	-	-	-	1	-	2	112	-	-	-
Minnesota																								
University of Minnesota	-	-	-	-	-	-	-	-	1	-	1	1	-	1	-	-	-	-	-	1	1	140	-	1
Missouri																								58
Kansas City-Western Dental College	-	12	7	2	14	5	-	-	1	-	3	1	-	6	38	-	1	2	-	1	1	-	1	34
St. Louis University	1	-	2	-	-	10	-	-	1	1	-	28	1	2	-	1	-	1	-	5	1	3	1	34
Washington University	2	-	7	-	2	2	-	-	-	-	-	13	1	1	2	2	-	-	-	2	-	-	1	-
Nebraska																								1
Creighton University	-	-	-	-	1	-	-	1	-	-	1	2	-	9	2	-	-	-	-	2	-	5	-	-
University of Nebraska	-	-	-	-	4	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-	-	1	-	-
New York																								
Columbia University	-	-	-	-	-	6	-	-	1	1	-	-	-	-	-	-	-	1	1	2	-	-	-	-
New York University	-	-	-	-	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University of Buffalo	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-
Ohio																								
Ohio State University	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Western Reserve University	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-
Oregon																								12
North Pacific College of Oregon	-	1	-	2	-	-	-	-	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	-
Pennsylvania																								
Temple University	-	-	-	-	-	22	17	2	1	-	-	-	-	-	-	-	-	1	1	6	-	-	-	-
University of Pennsylvania	-	-	-	-	-	14	1	1	1	-	-	-	-	-	-	-	-	3	1	2	-	-	-	1
University of Pittsburgh	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Tennessee																								1
Meharry Medical College	4	-	1	-	-	2	-	1	1	1	-	2	-	-	-	-	1	-	-	1	2	-	1	2
University of Tennessee	9	-	9	-	-	-	-	-	1	-	1	-	1	-	-	1	-	-	-	2	-	-	16	-
Texas																								
Baylor University	1	4	6	-	-	1	-	-	1	-	-	-	-	-	-	-	4	-	-	-	2	-	-	-
Texas Dental College	-	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-	1	-
Virginia																								1
Medical College of Virginia	-	-	-	-	-	-	-	1	2	-	-	7	-	-	-	-	-	-	1	-	-	-	-	-
Wisconsin																								
Marquette University	-	-	-	-	-	1	-	-	-	-	1	5	1	-	-	-	-	-	-	-	10	6	-	-
TOTAL	81	31	41	459	41	174	18	66	80	60	28	474	106	118	50	98	106	45	77	275	297	161	68	130

TABLE 6.—DISTRIBUTION OF UNDERGRADUATE STUDENTS BY STATES, TERRITORIES AND FOREIGN COUNTRIES IN THE DENTAL SCHOOLS OF THE UNITED STATES AS OF OCTOBER 15, 1940 (Continued)

Missouri	Montana	Nebraska	Nevada	New Hampshire	New Jersey	New Mexico	New York	No. Carolina	No. Dakota	Ohio	Oklahoma	Oregon	Pennsylvania	Rhode Island	So. Carolina	So. Dakota	Tennessee	Texas	Utah	Vermont	Virginia	Washington	W. Virginia	Wisconsin	Wyoming	U.S. Possessions	Canada	Other Foreign Countries	Total
-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	4	-	-	2	-	-	-	4	1	7	151
2	2	1	-	2	7	1	11	-	1	5	-	-	2	-	1	2	-	-	22	1	-	3	1	1	2	15	1	8	338
-	-	-	-	2	19	-	67	-	-	-	-	-	4	2	-	-	-	-	-	-	4	-	1	-	-	3	-	-	183
-	-	-	-	-	2	-	8	5	-	-	-	-	2	-	4	-	2	4	-	-	7	-	2	-	-	3	1	11	72
-	-	2	-	-	4	-	3	73	-	4	-	-	-	-	20	-	3	2	-	-	3	1	3	1	-	2	-	-	319
1	1	-	-	-	3	-	8	-	4	10	-	-	4	-	-	-	-	-	-	-	-	1	-	13	-	1	2	1	200
1	1	-	-	2	2	-	4	2	7	3	3	2	4	1	3	2	2	2	7	-	4	3	14	14	2	7	-	14	295
1	-	-	-	-	12	-	66	-	-	-	1	-	3	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1	224
-	-	-	-	-	3	-	3	-	-	7	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	2	-	-	113
2	2	-	-	-	2	-	4	-	3	-	-	-	2	-	-	1	-	-	-	-	-	-	-	1	1	-	-	-	112
1	-	-	-	-	2	-	30	2	1	3	-	-	-	-	2	-	11	1	-	1	-	-	9	-	-	1	-	-	177
1	-	-	-	-	1	-	3	2	-	2	2	-	1	-	-	-	1	5	-	-	-	-	-	-	-	0	-	4	154
-	-	-	-	1	58	-	101	7	-	1	1	-	4	3	4	-	-	-	-	3	3	-	13	-	-	6	-	1	310
-	-	-	-	10	4	-	19	-	-	-	-	-	1	11	-	-	-	-	-	2	-	-	-	-	1	-	1	3	146
-	-	-	-	14	4	-	39	-	-	-	-	-	1	18	-	-	-	-	-	-	-	-	1	-	-	1	-	1	257
-	-	-	-	-	-	-	2	-	-	1	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	105
-	-	-	-	-	7	-	15	-	-	4	-	-	1	-	-	-	-	-	-	1	-	-	1	-	-	1	-	10	158
1	3	-	-	-	1	-	4	-	3	-	-	1	-	-	-	3	-	-	-	-	-	1	-	18	2	1	3	4	197
38	1	2	-	-	-	10	2	-	6	-	47	-	2	-	2	-	-	4	1	1	-	1	-	1	-	5	1	1	240
34	2	1	-	-	10	-	33	-	-	2	2	-	4	7	-	-	-	1	-	2	-	-	1	2	-	4	-	2	167
24	2	-	-	-	-	-	10	-	-	1	5	-	-	-	-	-	1	4	-	1	1	-	-	3	-	1	-	1	90
1	6	18	1	1	-	-	3	-	1	-	1	1	-	-	-	9	-	-	-	-	-	-	-	2	6	2	-	-	76
-	-	38	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	48
-	-	-	-	-	14	-	187	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	215
-	-	-	-	-	20	-	528	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	581
-	-	-	-	-	3	-	132	-	-	1	-	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-	1	-	142
-	-	-	-	-	3	-	30	-	-	187	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	222
-	-	-	-	-	6	-	47	-	-	99	-	-	4	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	161
-	12	-	-	-	-	-	-	-	-	-	-	57	-	-	-	-	-	-	7	-	-	60	-	-	2	1	21	-	171
-	-	-	-	-	99	-	49	-	-	-	-	-	232	13	-	-	-	-	-	-	-	-	-	-	-	2	-	-	439
-	-	-	-	1	60	-	222	-	-	1	-	-	74	2	-	-	-	-	-	1	-	-	-	-	-	1	-	6	425
-	-	-	-	-	30	-	115	-	-	9	-	-	148	-	-	-	-	-	-	-	-	-	6	-	-	-	-	-	297
1	-	-	-	-	4	-	2	-	-	1	-	-	1	1	2	-	3	3	-	-	1	-	-	-	-	-	-	4	41
2	-	-	-	-	-	-	1	3	-	-	2	-	-	-	1	-	33	2	-	-	-	-	1	-	-	-	-	1	105
-	-	1	-	-	-	2	1	1	-	-	14	-	-	-	-	-	-	105	-	-	-	-	-	-	-	1	-	-	144
-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	1	75	1	-	-	-	1	-	-	-	-	-	87
-	1	-	-	-	3	-	13	34	-	1	-	-	2	-	11	-	-	-	-	1	70	-	5	-	-	-	-	-	135
-	3	-	-	-	4	-	38	-	4	1	-	-	2	-	-	1	-	-	-	-	-	-	-	135	-	2	-	-	215
130	36	64	5	31	402	19	1804	118	37	348	80	62	503	67	61	18	84	210	55	15	93	80	66	193	19	72	34	90	7730

TABLE 7.—FACULTIES IN THE DENTAL SCHOOLS OF THE UNITED STATES AS OF OCTOBER 15, 1940

	No. on Full Time	No. on Part Time	NUMBER HOLDING DEGREES						
			A.B. or B.S.	M.A. or M.S.	Ph.D.	M.D.	Other Degree	D.D.S. or D.M.D. Earned in Local School	D.D.S. or D.M.D. Earned Elsewhere
California									
College of Physicians & Surgeons	6	81	19	6	3	12	5	62	12
University of California	6	111	17	14	6	7	8	82	7
University of Southern California	30	53	14	10	5	16	10	40	19
District of Columbia									
Georgetown University	18	36	20	13	11	7	1	26	7
Howard University	18	3	10	6	6	5	1	7	7
Georgia									
Atlanta-Southern Dental College	9	40	10	1	1	10	20	32	5
Illinois									
Loyola University - Chicago	11	31	12	4	2	10	1	31	4
Northwestern University	18	65	18	8	5	13	36	53	13
University of Illinois	34	64	61	38	18	23	4	46	16
Indiana									
Indiana University	18	30	16	11	11	11	3	20	5
Iowa									
State University of Iowa	43	2	22	21	13	10	2	21	3
Kentucky									
University of Louisville	21	9	15	7	5	4	1	17	2
Louisiana									
Loyola University, New Orleans	6	51	18	11	3	8	4	26	6
Maryland									
University of Maryland	21	41	10	3	–	8	4	50	3
Massachusetts									
Harvard University	15	52	19	1	5	11	6	119	9
Tufts College	7	64	7	1	1	5	5	63	5
Michigan									
University of Detroit	13	25	9	10	2	6	2	6	22
University of Michigan	20	24	14	14	–	2	5	39	–
Minnesota									
University of Minnesota	7	48	10	2	2	4	2	52	3
Missouri									
Kansas City-Western Dental College	11	33	14	2	–	8	3	22	1
St. Louis University	13	43	14	4	7	14	7	17	8
Washington University	11	25	5	5	2	2	1	25	5
Nebraska									
Creighton University	2	38	18	2	4	–	5	15	6
University of Nebraska	5	33	4	6	6	10	20	23	22
New York									
Columbia University	22	113	64	18	17	28	10	28	61
New York University	39	142	57	17	18	22	6	122	17
University of Buffalo	28	60	18	7	14	37	4	35	1
Ohio									
Ohio State University	11	22	3	6	5	5	1	26	1
Western Reserve University	11	60	25	7	10	15	6	32	7
Oregon									
North Pacific College of Oregon	15	33	16	4	1	12	3	22	9
Pennsylvania									
Temple University	19	55	10	5	6	10	11	45	35
University of Pennsylvania	24	67	20	6	10	23	5	51	8
University of Pittsburgh	27	49	29	5	1	8	9	55	8
Tennessee									
Meharry Medical College	15	10	14	2	1	5	10	13	4
University of Tennessee	35	12	28	12	12	19	3	7	8
Texas									
Baylor University	4	36	7	5	4	10	3	14	10
Texas Dental College	11	34	12	3	–	12	9	14	13
Virginia									
Medical College of Virginia	11	17	11	7	4	3	1	12	9
Wisconsin									
Marquette University	4	47	21	3	1	9	1	30	6
TOTALS	641	1759	711	307	222	424	240	1410	387

TABLE 8.—FEES, ADMINISTRATIVE OFFICERS AND SESSIONS IN THE DENTAL SCHOOLS OF THE UNITED STATES

SCHOOL OR COLLEGE	ANNUAL FEE First Year	Second Year	Third Year	Fourth Year	Total	DEAN	SESSION 1940-1941
California							
College of Physicians & Surgeons	$290.00	$250.00	$250.00	$275.00	$1065.00	Ernest G. Sloman	Sept. 3 April 26
University of California	274.00	269.75	260.00	259.00	1062.75	Willard C. Fleming	Aug. 22 May 17
University of Southern California	305.00	305.00	305.00	305.00	1220.00	Lewis E. Ford	Sept. 16 June 7
District of Columbia							
Georgetown University	335.00	330.00	320.00	345.00	1330.00	Joseph L. B. Murray	Sept. 23 June 9
Howard University	199.50	194.50	194.50	211.50	800.00	Russell A. Dixon	Sept. 29 June 13
Georgia							
Atlanta-Southern Dental College	325.00	325.00	325.00	325.00	1300.00	Ralph R. Byrnes	Sept. 25 June 4
Illinois							
Loyola University, Chicago	345.00	345.00	345.00	360.00	1395.00	William H. G. Logan	Oct. 1 May 31
Northwestern University	325.00	315.00	315.00	346.00	1301.00	Charles W. Freeman	Sept. 30 June 14
*University of Illinois	260.00	250.00	250.00	265.00	1025.00	Howard M. Marjerison	Sept. 23 June 6
Indiana							
Indiana University	236.25	255.00	255.00	280.00	1026.25	William H. Crawford	Sept. 14 June 2
Iowa							
*State University of Iowa	194.00	194.00	194.00	194.00	776.00	Alvin W. Bryan	Sept. 26 June 2
Kentucky							
University of Louisville	225.00	225.00	225.00	225.00	900.00	John T. O'Rourke	Sept. 23 May 31
Louisiana							
Loyola University, New Orleans	317.35	302.35	327.35	327.35	1274.40	Sydney L. Tiblier	Sept. 16 June 2
Maryland							
*University of Maryland	323.00	298.00	300.00	315.00	1236.00	J. Ben Robinson	Sept. 24 June 7
Massachusetts							
Harvard University	400.00	400.00	400.00	400.00	1600.00	Leroy M. S. Miner	Sept. 23 June 19
Tufts College	415.00	410.00	410.00	420.00	1655.00	Basil G. Bibby	Sept. 19 June 16
Michigan							
University of Detroit	419.00	419.00	419.00	429.00	1686.00	Leo A. Cadarette	Sept. 16 June 4
*University of Michigan	230.00	230.00	230.00	230.00	920.00	Russell W. Bunting	Sept. 30 June 21
Minnesota							
*University of Minnesota	229.00	214.00	214.00	221.50	878.50	William F. Lasby	Sept. 30 June 13
Missouri							
Kansas City-Western Dental College	322.00	315.00	297.50	307.50	1242.00	Roy J. Rinehart	Sept. 23 June 3
St. Louis University	320.00	345.00	335.00	345.00	1345.00	Thomas E. Purcell	Sept. 24 June 3
Washington University	300.20	278.20	293.20	293.20	1164.80	Benno E. Lischer	Sept. 26 June 10
Nebraska							
Creighton University	282.75	260.00	290.00	305.00	1137.75	Frank J. Viner	Sept. 20 June 5
University of Nebraska	248.00	248.00	237.00	234.00	967.00	Bert L. Hooper	Sept. 19 June 9
New York							
Columbia University	542.00	550.00	550.00	570.00	2212.00	Willard Cole Rappleye H. Holliday, Associate	Sept. 19 June 3
New York University	491.00	478.00	458.00	458.00	1885.00	Allen T. Newman	Sept. 11 May 24
University of Buffalo	741.64	736.64	746.64	—	2224.92	Edward W. Koch R. W. Groh, Associate	July 1 June 7
Ohio							
*Ohio State University	196.00	196.00	196.00	196.00	784.00	Wendell D. Postle	Oct. 1 June 16
Western Reserve University	391.00	383.00	375.00	385.00	1534.00	William L. Wylie	Sept. 19 June 11
Oregon							
North Pacific College of Oregon	305.00	305.00	307.00	315.00	1232.00	Louis J. FitzPatrick	Oct. 1 May 28
Pennsylvania							
Temple University	370.00	335.00	320.00	320.00	1345.00	I. Norman Broomell	Sept. 25 May 15
University of Pennsylvania	420.00	415.00	415.00	415.00	1665.00	Charles R. Turner	Sept. 23 June 11
University of Pittsburgh	405.00	400.00	400.00	410.00	1615.00	H. Edmund Friesell	Sept. 23 June 28
Tennessee							
Meharry Medical College	225.00	205.00	225.00	235.00	890.00	Donley H. Turpin	Oct. 1 May 27
*University of Tennessee	181.50	181.50	181.50	181.50	726.00	Edgar D. Rose	Sept. 26 June 7
Texas							
Baylor University	333.00	318.00	308.00	318.00	1277.00	Frederick W. Hinds	Sept. 30 June 2
Texas Dental College	300.00	312.50	312.50	342.50	1267.50	Frederick C. Elliott	Sept. 23 June 9
Virginia							
*Medical College of Virginia	347.00	347.00	347.00	349.00	1390.00	Harry Bear	Sept. 17 June 3
Wisconsin							
Marquette University	314.00	304.00	304.00	319.00	1241.00	Henry L. Banzhaf	Sept. 23 June 11

*Total Fee for Non-Residents

Illinois	$1225.00	Maryland	$1636.00	Minnesota	$1118.50	Tennessee	$1152.00
Iowa	1132.00	Michigan	1280.00	Ohio	1384.00	Virginia	1580.00

TABLE 9.—NUMBER OF STUDENTS ENROLLED IN THE FRESHMAN CLASSES IN THE DENTAL SCHOOLS OF THE UNITED STATES, AS OF OCTOBER 15, 1940, NUMBER ACCEPTED WHO DID NOT MATRICULATE AND NUMBER REJECTED

SCHOOL OR COLLEGE	No. Enrolled	No. Accepted Who Did Not Matriculate	No. Rejected
California			
College of Physicians & Surgeons	43	7	16
University of California	62	12	21
University of Southern California	119	29	30
District of Columbia			
Georgetown University	56	16	165
Howard University	24	12	31
Georgia			
Atlanta-Southern Dental College	118	45	34
Illinois			
Loyola University - Chicago	92	22	21
Northwestern University	72	27	46
University of Illinois	61	30	113
Indiana			
Indiana University	47	26	48
Iowa			
State University of Iowa	37	4	12
Kentucky			
University of Louisville	47	6	94
Louisiana			
Loyola University - New Orleans	45	23	11
Maryland			
University of Maryland	86	47	47
Massachusetts			
Harvard University	40	8	62
Tufts College	74	51	150
Michigan			
University of Detroit	22	2	30
University of Michigan	42	8	98
Minnesota			
University of Minnesota	64	11	No Record
Missouri			
Kansas City-Western Dental College	91	9	26
St. Louis University	54	20	10
Washington University	16	7	33
Nebraska			
Creighton University	18	9	6
University of Nebraska	12	6	8
New York			
Columbia University	60	9	179
New York University	157	No Record	212
University of Buffalo	56	19	218
Ohio			
Ohio State University	62	6	70
Western Reserve University	41	47	87
Oregon			
North Pacific College of Oregon	55	14	13
Pennsylvania			
Temple University	116	15	76
University of Pennsylvania	116	37	100
University of Pittsburgh	96	27	23
Tennessee			
Meharry Medical College	12	11	7
University of Tennessee	33	4	10
Texas			
Baylor University	36	12	15
Texas Dental College	34	6	13
Virginia			
Medical College of Virginia	33	17	69
Wisconsin			
Marquette University	56	27	55

TABLE 10.—DENTAL LICENSING EXAMINATIONS IN 1939

	No. Examined	No. Passed	% Passed	No. Failed	% Failed	No. Schools Represented	No. Licensed
Alabama	19	16	84	3	16	5	16
Arizona	10	3	30	7	70	7	3
Arkansas	15	12	80	3	20	6	12
California	204	161	79	43	21	27	161
Colorado	21	16	76	5	24	9	16
Connecticut	77	67	87	10	13	22	67
Delaware	13	4	31	9	69	6	4
District of Columbia	48	21	44	27	56	12	21
Florida	52	29	56	23	44	18	29
Georgia	25	19	76	6	24	3	19
Idaho	10	5	50	5	50	6	5
Illinois	170	158	93	12	7	12	149
Indiana	58	53	91	5	9	9	53
Iowa	60	55	92	5	8	7	54
Kansas	32	32	100	–	–	3	30
Kentucky	18	14	78	4	22	5	14
Louisiana	31	31	100	–	–	4	31
Maine	9	9	100	–	–	4	9
Maryland	35	33	94	2	6	5	33
Massachusetts	100	97	97	3	3	21	97
Michigan	59	44	75	15	25	8	44
Minnesota	89	88	99	1	1	7	87
Mississippi	20	19	95	1	5	7	19
Missouri	73	60	82	13	18	5	60
Montana	17	11	65	6	35	5	11
Nebraska	35	32	91	3	9	3	32
Nevada	10	6	60	4	40	7	6
New Hampshire	13	9	70	4	30	5	9
New Jersey	156	77	49	79	51	25	77
New Mexico	11	3	28	8	72	8	3
New York	522	410	79	112	21	22	410
North Carolina	43	30	70	13	30	10	30
North Dakota	9	9	100	–	–	2	8
Ohio	74	70	95	4	5	12	70
Oklahoma	28	28	100	–	–	9	28
Oregon	39	33	85	6	15	5	33
Pennsylvania	184	173	94	11	6	17	180
Rhode Island	21	21	100	–	–	8	21
South Carolina	17	9	53	8	47	3	9
South Dakota	7	5	71	2	29	6	5
Tennessee	18	18	100	–	–	3	18
Texas	84	53	63	31	37	21	53
Utah	6	5	84	1	16	5	5
Vermont	9	5	56	4	44	6	5
Virginia	62	54	87	8	13	15	38
Washington	62	28	45	34	55	14	28
West Virginia	17	16	94	1	6	8	16
Wisconsin	42	40	95	2	5	7	40
Wyoming	10	5	50	5	50	5	5
TOTALS	2744	2196	80	548	20	47	2173

NEWS ITEMS

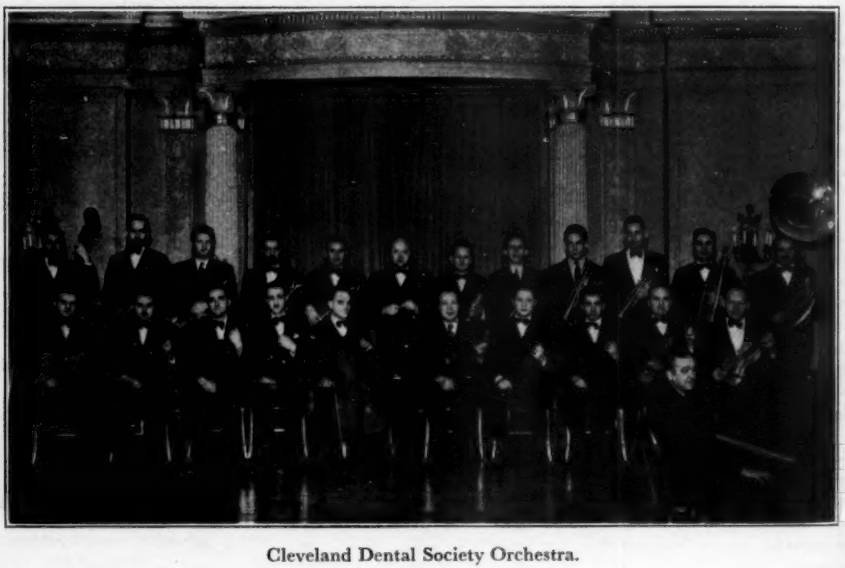
CLEVELAND DENTAL SOCIETY

MAY 5, 6, 7, 1941, the Cleveland Dental Society will hold its Annual Spring Clinic at the Statler Hotel, Cleveland, Ohio.

May 6, in association with the clinic, the Cleveland Dental Society Orchestra, in conjunction with the Orpheus Male Chorus of Cleveland, will play in the Music Hall of the Public Auditorium.

CLEVELAND DENTAL SOCIETY ORCHESTRA

FROM a group of six, sometimes eight, men who met infrequently to share a common love for the making of music, there has evolved the



Cleveland Dental Society Orchestra.

thirty piece Cleveland Dental Society Orchestra, a trained group of musicians who now appear regularly in concert for the monthly meetings of the dental society and for the more important occasions which arise.

But it is toward the date of May 6 that the expectancy and eagerness of every man in the orchestra is turned; for, on that date, the Cleveland Dental Society Orchestra will appear in a professional rôle. As the outstanding social event of the Annual Spring Clinic of the Cleveland Dental Society, there will be a music festival in the Music Hall of Cleveland's Public Auditorium. In addition to the orchestra,

the world famous Orpheus Male Chorus will take part, and there will be several individual acts by talented members of the society.

To blend a group of thirty instrumentalists into one orchestra is no easy task. In 1938, when the orchestra was formed, Frank Nealon was assigned to the baton post, and, under his direction, the orchestra made remarkable progress. In 1940, Dr. Nealon relinquished the podium because of the severe demands that it made upon his time, although he retained his seat in the orchestra. It was then that Walberg Brown, musical director of WGAR, Cleveland, a member of the faculty of the Cleveland Institute of Music, and former first bench violinist with the Cleveland Symphony Orchestra, was chosen for the position of director. With weekly rehearsals, the orchestra built up a fine repertoire, achieving a balance and smoothness that soon distinguished it. In addition to the monthly meetings of the society, it has played for the Cleveland Child Health Clinic and numerous other affairs.

In preparation for its professional debut, the orchestra has been undergoing a gruelling routine. For several months, it has been meeting each Sunday morning in strenuous rehearsal, and as the time approaches for the great event, rehearsals have been lengthened and scheduled for twice a week.

All members of the American Dental Association are invited to attend the musical and the Spring Clinic.

A DENTAL SCHOLARSHIP AT HARVARD

A NATIONAL scholarship has been established in Harvard's new school of dental medicine, which opens next September, to enable a young man of outstanding ability and promise to study dentistry, no matter what his financial circumstances may be.

This year, the award will go to a third or fourth year student in a college or university situated in Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, North Dakota or South Dakota.

Since the national scholarship is regarded as a prize to be competed for by all students, whatever their financial circumstances, the stipend will vary from a minimum of $100 to a maximum of $1,000, according to the need of the recipient.

A successful applicant who maintains an honor record at Harvard will continue to hold the scholarship throughout the five-year course leading to the M.D. and D.M.D. degrees.

The award will be made by the Committee on Scholarships in the Harvard School of Dental Medicine on the basis of the applicant's academic record, recommendations, extra-curricular activities and general promise. The requirements for admission and promotion in Harvard Medical School and Harvard School of Dental Medicine are identical.

Harvard established the new school of dental medicine for the purpose of training new types of scientific workers, combining the skill of both medicine and dentistry, for an attack on the public health problem of dental disease.

The new school has been made possible by gifts from the Carnegie Corporation, the Rockefeller Foundation and the John and Mary R. Markle Foundation. Its permanent assets for teaching and research in dentistry will total $2,550,000.

GOLD USED IN DENTISTRY

LAST year, latest available Bureau of the Census figures show, $1,487,432 worth of gold leaf and foil and $8,215,647 worth of dental gold were manufactured in the United States.

During the same period, $101,783,864 in gold, silver and platinum was resmelted and rerefined and $458,720 worth of imitation gold, aluminum and colored leaf and $162,838 of aluminum, silver and other leaf were processed.

These figures are given in three preliminary reports of the 1939 Census of Manufactures recently issued. The three reports cover the gold and silver leaf and foil industry, the secondary smelting and refining of gold, silver and platinum and the dental equipment and supplies industry.

The total production for 1939 of the gold and silver leaf and foil industry amounted to $2,108,990, according to the report. In addition to the $1,487,432 of gold leaf and foil, this industry also turned out $458,720 of imitation gold, aluminum and colored leaf and $162,838 of aluminum, silver and other leaf.

The gold leaf and foil were reported under two classifications, packs of 500 sheets, and sized and unsized rolls, 100 feet long by 1 inch wide.

Altogether, 86,264 packs of sheets, on which a factory value of $1,234,540 was placed, and 76,616 rolls valued at $252,892 were produced last year. The sheets of gold leaf and foil were mostly standard $3\frac{3}{8}$ inch square sheets in common use, though some sheets, $3\frac{3}{8}$ by $3\frac{7}{8}$ inches, were also included. Ordinary gold foil is slightly thicker and heavier than ordinary gold leaf, though gold leaf, when affixed to a metal, paper or composition base, is frequently thicker, and often heavier than ordinary gold foil.

The imitation gold, aluminum and colored leaf was reported in rolls 100 feet long by 1 inch wide. Last year's production amounted to 1,959,475 rolls. Imitation gold is made chiefly from Dutch metal and copper alloy; aluminum leaf by treating paper or thin, tough metal with aluminum lacquer. Colored leaf includes paper, aluminum, tin and fiber composition treated with gilt lacquer made from bronze.

The gold and silver leaf and foil industry is one of the oldest in the world, embracing the gold beaters who hammer out gold by the same painstaking method that was old in the days of Babylon by covering the gold with a goldbeater's skin and pounding it to the proper thinness with a wooden mallet. Goldbeater's skin is made from the prepared outside membrane of the large intestines of the ox. Through the ages, no other material has been found that will serve the same purpose.

No production figures were reported for the secondary smelting and refining of gold, silver and platinum. This industry covers establishments engaged in the secondary smelting, refining and alloying of precious metals, principally for the use of jewelers and silversmiths, from bullion, sweepings, scrap and old metal. The production from ore is not included.

Last year's output of the industry was valued at 10.5 per cent higher than the 1937 output, $101,783,864 as compared with $92,093,302.

There were sixty-six establishments in the secondary smelting and refining industry during 1939, providing employment for 238 salaried workers and an average of 1,115 wage earners. The salaried workers were paid salaries aggregating $848,022, and the wage earners, $1,686,944.

The number of gold and silver leaf and foil producing establishments in 1939 was twenty-six. The industry employed sixty-four salaried persons and an average of 563 part-time and full-time wage earners, paying the salaried workers $201,590 and the wage earners, $469,577.

CORRESPONDENCE

"THE UNERUPTED THIRD MOLAR FROM AN ORTHODONTIC POINT OF VIEW"

To the Editor:

In his excellent contribution to the study of the unerupted third molar from an orthodontic point of view in the December JOURNAL, Ford, of Chicago, presents some new and interesting data to the profession.

Among his conclusions, he states that "the orthodontic case cannot be dismissed as completed until the third molars are erupted into normal position or extracted." With this conclusion, we are wholly in accord. Too often have we observed crowding of the anterior teeth following the completion of orthodontic treatment, at which time the third molars are finally "discovered."

In his paper, Ford mentions the problem and cites an example of the undeveloped third molar with no root formation, in a patient aged 17. (Fig. 22.) For surgical reasons, the removal of these undeveloped molars is postponed. We assume that "surgical" implies an extensive operation requiring considerable ossisection with its accompanying severe postoperative edema, trismus, risk of infection, etc.

Before the introduction of the technic employing the sectional removal of these teeth, we would have agreed fully on the advisability of postponement in these cases. Since the introduction of this technic, however, with its use of the automatic mallet, the surgical removal of these bodies has been much simplified. In an article in THE JOURNAL (July 1938, p. 1053) describing the splitting technic for impacted third molars, we stated, under removal of unerupted third molars in young people prior to the formation of the roots: "These solid enamel bodies, suggesting a ball and socket formation, are recognized by the experienced oral surgeon as difficult cases. The ability of the automatic mallet to divide these freely movable crowns into sections is of immeasurable aid in simplifying their removal."

Our success in the treatment of a series of such cases has led us to the conviction that it is no longer necessary for the orthodontist to keep a completed case under observation (often three or four years is necessary) until root formation has begun. We are submitting, herewith, roentgenograms of a case similar to Ford's Figure 22. Here the age of the patient is 18 years and 6 months. The orthodontist had completed the treatment at this time and ordered the removal of the third molar. It is evident that the distal osseous structure is entirely undisturbed. The patient suffered no more than the usual postoperative discomfort. Swelling and cellulitis were slight, and the trismus had entirely cleared up within forty-eight hours. The patient was, of course, ambulatory at all times. We consider the sectioning of these "loose" bodies a marked advance in the surgical technic for their removal.

HARRY J. FIELD, D.D.S., and
ALFRED A. ACKERMAN, D.D.S.,
130 Market St.,
Newark, N. J.

OBITUARIES

ALEXANDER H. PATERSON, D.D.S.
(1878-1941)

ALEXANDER HORN PATERSON, D.D.S., died in Baltimore, Md., February 4, 1941. He was born in Arnot, Tioga County, Pennsylvania, May 11, 1878, the son of Henry and Elizabeth Paterson, who came to this country from Cumbernold, Scotland, in 1869. Dr. Paterson spent his early years in Wilkes-Barre, Pa., where, at 15 years of age, he began work as a coal miner. After two years in the mines, he joined an older brother in the retail meat business, continuing in that field until he made his decision to take up the study of dentistry.

Having abandoned school attendance for employment at an early age, Dr. Paterson, at 28, was faced with the very difficult problem of acquiring the credits in secondary education necessary for his admission to dental schools. He entered Starkey Academy, now Lakemont Academy, in Lakemont, N. Y., where he completed the New York regents requirements for recommendation to a dental school. In the fall of 1908, he entered the dental school of the University of Maryland. During his three years at the university, he distinguished himself as a student. He sought diligently to master every detail of the course. Demonstrating a high quality of scholarship and unusual technical proficiency, he earned first honors in all instances in which recognition was made for technical proficiency. He was awarded the university gold medal given to the senior of highest rank. His record of achievement as a student gave promise of his future successful career.

Upon graduation, Dr. Paterson established a practice with T. S. Waters, one of Baltimore's distinguished dentists, dividing his time between private practice and teaching in the dental school of the university. Inspired by the splendid prosthetic work of Dr. Waters and spurred by his own creative ability and a strong desire to contribute to the progress of dentistry, he began at once to perfect himself in prosthetic procedures. As a student under this young teacher, I was deeply impressed with his expressed determination to raise the prosthetic art to the point at which it would be esteemed more for its scientific and esthetic qualities than for its mere mechanical excellence. He devoted himself diligently and constantly to this purpose, working as only the true artist and faithful scientist can work.

Dr. Paterson's thorough study of the accomplishments of others in his field soon made him intimate with the work of his predecessors as well as with that of his contemporaries. His initiative, shown so frequently during his lifetime, brought about the founding of the American Society of Prosthodontists, organized at the Congress Hotel, Chicago, August 4, 1918. Six men responded to the call for the organization meeting: D. D. Campbell, M. M. House, S. H. McAfee, Alex H. Paterson, B. F. Thielan, and George H. Wilson. Dr. Paterson was the secretary of the founding meeting. He left among his papers the original minutes written in pencil on rough paper, from which the foregoing information is taken.

Early in his career, Dr. Paterson limited his practice to full and partial denture service. He was a tireless worker, serving a large and discriminating clientele, while continuing to teach in the dental school and to serve his profession by lecturing to dental societies all over the country. Few men have served the profession more widely and more effectively than he. In 1923 he spent several weeks in Europe, appearing before the leading dental societies of

the British Isles and of Europe. He published numerous original articles in addition to contributions to textbooks on prosthetic dentistry.

Dr. Paterson's original contributions to the science of denture construction rank among the notable accomplishments of modern dentistry. These include a sectional partial impression technic; a method of denture reproduction; ground curves of occlusion in full denture construction; a system of tooth arrangement to fit the ground curves of occlusion; scientifically designed trays for compound-plastic technic; an idea for flat surface utilization to aid in denture retention, and many other methods and devices that have proved useful to the prosthetist.

Dr. Paterson was always active in organization affairs. As president of the Maryland State Dental Association, in 1927, he recommended in his presidential address that a plan be developed to celebrate suitably the centennial of dentistry. It was his foresight that made

ALEXANDER H. PATERSON
1878-1941

possible the 1940 Dental Centenary Celebration in Baltimore. As chairman of the Committee on Historical Exhibits, he designed the floor arrangement of the great Fifth Regiment Armory, which was such an impressive feature of the centenary. Because of his interest in and knowledge of the history of prosthetic dentistry, he was chosen to write a history of prosthetic dentistry, "Seeing Prosthesis Through the Eyes of the *Dental Cosmos*," for the seventy-fifth anniversary number of *Dental Cosmos*, January 1934.

Dr. Paterson was for many years a member of the board of visitors of Lakemont Academy and an elder in the Second Presbyterian Church of Baltimore. He was a Fellow of the American College of Dentists and a member of Omicron Kappa Upsilon Fraternity, of Psi Omega Fraternity, of Oriental Lodge A.F. and A.M., of the Chesapeake Consistory and of Boumi Temple, A.A.O.N.M.S.

Dr. Paterson married Catherine Haas, June 2, 1914. To this union, four daughters were born, Jean, Bess, Ann and Ruth. Outstanding characteristics of Dr. Paterson were his devotion to his family, his unswerving fidelity to his friends and his staunch loyalty to his profession. His contributions to dentistry are impressive parts of its records, but the inspiration and enthusiasm that he transmitted to students and associates were immeasurable contributions to the success of others that cannot be recorded.

J. BEN ROBINSON.

I. NORMAN BROOMELL, D.D.S.
(1858-1941)

I. NORMAN BROOMELL, dean of Temple University School of Dentistry, died March 23, at his residence on Horter Street, Germantown, Pa., after a brief illness.

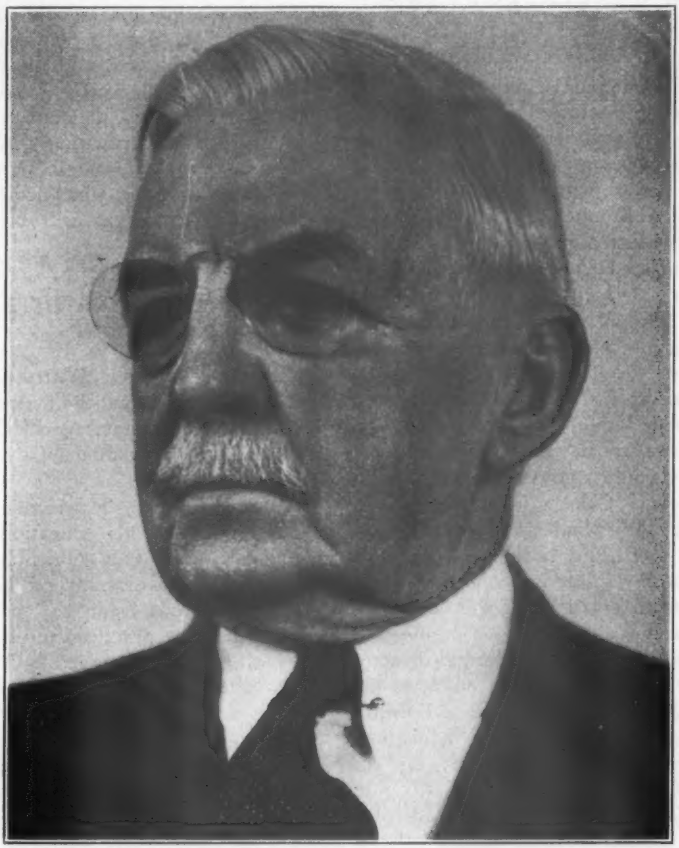
Dr. Broomell was born in Chester County, Pennsylvania, November 25, 1858. After obtaining his early education in the public schools of Chester County and Friends Central School, he entered the Pennsylvania College of Dental Surgery, from which he was graduated in 1879. Two years later, he was appointed to the faculty of the Pennsylvania College of Dental Surgery. In 1896, he was made chief instructor in the prosthetic department of the college.

In 1898, he became professor of dental anatomy, dental histology and prosthetic technics, a chair which he held until 1906, when he was called to the Medico-Chirurgical College, where he became dean and professor of dental anatomy, dental histology and prosthetic dentistry. In 1916, the school was absorbed by the University of Pennsylvania and Dr. Broomell became a member of the dental faculty of Temple University, a new chair of dental anatomy and clinical dentistry being created and filled by him. In 1918, he succeeded Simeon H. Guilford as dean.

Dr. Broomell was the author, with Philipp Fischelis, M.D., of "Anatomy and Histology of the Mouth and Teeth," a text known throughout the world and which was assigned a position in the British Museum. This text has reached its sixth edition. He also wrote "Practical Dentistry for Practical Dentists." He was perhaps the first to introduce lantern slide illustrations for teaching purposes. From 1892 to 1897, he was associate editor of *Dental Brief*, to which he made many contributions. Dr. Broomell belonged to numerous dental and civic societies here and abroad, and was the recipient of several honorary degrees.

Dean Broomell helped to blaze trails into the unexplored realms of science and did this so successfully that he materially lightened the burdens of many scientific investigators who followed in his foot-steps.

As dean, professor, author and teacher, his wisdom and judgment has greatly benefited students, practitioners and humanity in general. Public spiritedness dominated his life of service to all mankind, irrespective of race, color or creed. His kindliness and dignity of bearing exemplified the purity of his soul and made him an outstanding figure at any gathering in which he appeared. Always he was a loyal friend and counsellor, an indefatigable worker, generous to a fault, an inspiring personality.



I. NORMAN BROOMELL
1858-1941

It is said that calmness of mind is one of the jewels of wisdom. This attribute was his because of early training in self control and the development of patient thought and effort in all his undertakings. He was beloved by both faculty and student-body as a truly understanding leader, knowing how to govern others because he had learned how to govern himself.

During his early years, Dr. Broomell was a machinist, working in the machine shops of his father's firm. Recognizing that he could use his skillful hands in alleviating pain and suffering, he was

attracted to dentistry, later to become a teacher and author of international reputation and an authority in his field of education.

C. BARTON ADDIE.

THE PHILADELPHIA COUNTY DENTAL SOCIETY RESOLUTIONS ON THE DEATH OF DR. BROOMELL

The Philadelphia County Dental Society, being assembled in solemn conference this twenty-eighth day of March, 1941, and being apprised with deep regret of the demise of our brother, I. Norman Broomell, March 23, 1941, do hereby decree and resolve that

WHEREAS, I. Norman Broomell has been associated with it since 1879, which was the year of his graduation from the Pennsylvania College of Dental Surgery; and

WHEREAS, I. Norman Broomell had established himself over a period of sixty years as an outstanding and efficient educator and writer, first at the Pennsylvania College in 1896, later as dean of the Medico-Chirurgical College in 1906, and recently as dean of the Temple University School of Dentistry, from 1918 until his untimely death; and

WHEREAS, the said I. Norman Broomell had in life ever been a credit to the profession of dentistry, and a bulwark of charity and progressive education, and distinguished himself as one of Philadelphia's leading sons,

Resolved, that it, the Philadelphia County Dental Society, go officially on record as lamenting the death of one of its most illustrious sons, and be it further

Resolved, that a record of these proceedings be made and duly inscribed in the minutes.

L. BIDDLE DUFFIELD.
JOSEPH HUGGINS.
WILLIAM J. MCKINLEY, *Chairman.*

JULIETTE A. SOUTHARD

IT is with deepest regret that we announce the death of Mrs. Juliette A. Southard, the founder and animating spirit of the American Dental Assistants Association, which occurred November 12, 1940, at St. Petersburg, Fla.

The association was the culmination of a sincere effort to serve dentistry in the most efficient manner, and the development of the association as a most valuable ancillary service to dentistry is attributable to an unceasing enthusiasm and an indefatigable energy. Mrs. Southard's enthusiasm and effort for the welfare of her colleagues will be greatly missed.

CHARLES LINCOLN WHITE, D.D.S. (1877-1941)

CHARLES LINCOLN WHITE, pioneer Oklahoma dentist, and the first president of the Oklahoma Dental Association, died at his home in Oklahoma City, February 24.

He was born in Rogersville, Tenn. and he obtained his education in the public schools of that state. He graduated from the University of Tennessee in 1899. In 1901 he moved to Granite, Okla., where he practiced until January 1903, after which he moved to Oklahoma City, where he became interested in uniting the two territorial dental societies into the Oklahoma Dental Society. When this union was accomplished, Dr. White was elected as the first president of the new state association.

Dr. White not only served as the first president of the Oklahoma Dental Association, but, being interested in the progress of his profession, he held responsible places on many committees. Perhaps his finest contribution to dentistry was in his service on the Legislative Committee, through which he helped to shape the laws governing dental practice in the State of Oklahoma.

Dr. White's interest and influence in dental circles reached far beyond the boundary of Oklahoma through his work on the staff of the University Hospital, at Oklahoma City. Through this post, as a teacher, he contributed much toward the progress that is being made by the young dentists of Oklahoma as well as of the surrounding states. His influence has also been felt in the circle of the American Dental Association, of which he was a Trustee for nine years, representing the Twelfth District.

A capable dentist, and a leader of men, both at home and abroad, he will be greatly missed throughout the profession.

DEMPSEY D. CREWS, D.D.S.
(1882-1940)

DEMPSEY DEBOIS CREWS, D.D.S., died October 3, 1940, at Jacksonville, Fla. His death, ending a fine professional career, was a severe shock and loss to his many friends throughout the Southeast.

After his graduation from the Southern Dental College, in 1906, Dr. Crews established himself in Ft. Myers. He moved to Jacksonville in 1920.

Dr. Crews was always a strong believer in organized dentistry, maintaining continuous membership in all dental society groups. He was awarded the degree of "Honorable Fellow" by his state society in 1932. He served two years as secretary of the state society and was at one time president of the North Eastern District, besides serving on many important committees.

Perhaps most important, other than his professional achievements, was his personal influence upon all who knew him as a friend—capable, generous and endowed with character and a personality that won for him many lasting friendships.

H. K. CREWS.

DEATHS

APPLEBAUM, ALEXANDER M., San Francisco, Calif.; College of Physicians and Surgeons of San Francisco, 1925; died recently.

BEATTY, ROBERT W., SR.; New Kensington, Pa.; University of Pittsburgh School of Dentistry, 1904; died March 6.

CLAY, EDWIN A., San Francisco, Calif.; University of California, College of Dentistry, 1897; died recently.

FURMAN, JAMES R., Boyne City, Mich.; University of Michigan School of Dentistry, 1899; died December 21; aged 68.

HART, CHARLES E., San Francisco, Calif.; University of California, College of Dentistry, 1896; died recently.

HAUPT, HERMAN, Pittsburgh, Pa.; Ohio College of Dental Surgery, 1892; died January 17; aged 83.

OSBORN, RAY WALTER, Pittsburgh, Pa.; University of Pittsburgh School of Dentistry, 1917; died December 23; aged 45.

PARSONS, PERRY O., Cleveland, Ohio; Western Reserve University School of Dentistry, 1895; died November 14; aged 71.

RICKLEY, J. LLOYD, Oakland, Calif.; University of California College of Dentistry, 1919; died November 28.

STEINHEISER, A. F., Indianapolis, Ind.; Central College of Dentistry, 1900; died December 21; aged 65.

STRONG, IRVING E., New York, N. Y.; Pennsylvania College of Dental Surgery, 1900; died December 26.

TAGGART, CAMPBELL CLARKE, Pittsburgh, Pa.; University of Pennsylvania School of Dentistry, 1894; died January 15; aged 78.

TOWNSEND, EMORY L., Los Angeles, Calif.; Pennsylvania College of Dental Surgery, 1878; died November 11; aged 85.

WALKER, EDWIN W., Cleveland, Ohio; Western Reserve University School of Dentistry, 1901; died January 6; aged 57.

WEIMAN, CHARLES, New York, N. Y.; New York University College of Dentistry, 1919; died December 15.

INCIDENTS OF PRACTICE

Importance of Careful Diagnosis

By H. H. Gould, D.D.S., New York, N. Y.

Figure 1 shows a cystic area over the apex of the upper left central incisor, which carries a porcelain jacket crown, suggesting that

Fig. 1.—Cystic area.

surgical intervention was immediately necessary.

Figure 2 shows the same area at a different angulation, now over the right central

Fig. 2.—Cystic area (Fig. 1) at different angulation.

incisor, and not in any way connected with the left. If it had been a cyst over the left central incisor, it would still have appeared over that area no matter what the roentgenographic angulation was. The lamina dura around both teeth is clearly visible.

Figure 3 shows the area at the median line in the incisal canal. Since the cyst was a benign growth with no swelling or tenderness or other clinical symptoms in the anterior palatine region, the condition was left unchanged for periodic observation.

One can understand how Figure 1 might have been misinterpreted and unless the

Fig. 3.—Area at median line in incisal canal.

other roentgenograms had been taken, surgical intervention might have been deemed necessary, with the loss of the anterior tooth.

285 Madison Avenue.

Removal of Anterior Maxillary Alveolar Process from Second Bicuspid to Second Bicuspid

By James L. Lillie, D.D.S., Huntington, W. Va.

A woman, aged 31, presented an extreme overbite, marked loss of the vertical dimension and prominence of the anterior teeth and maxillae.

The overstimulation and overdevelopment of the maxillae, with a noticeable prominence in profile, undoubtedly had a hereditary history, as three other members of the family, all sisters, had a similar condition. The accompanying overclosure of the jaws, with traumatic occlusion, unquestionably exaggerated the hereditary characteristics in this case.

From the history, it seemed that there had been a progressive breakdown of the investing tissue. The lines of force were contrary

to the long axes of the teeth, and a full roentgenographic examination revealed extreme horizontal alveolar atrophy of all the teeth.

April 6, all the maxillary teeth, with the exception of the second molars, and all the mandibular teeth were extracted and an alveolectomy was performed from second bicuspid to second bicuspid.

May 4, hydrocolloid impressions were taken of the upper and lower jaws and the necessary changes in arrangement of the teeth and an increase in vertical dimension were accomplished.

Appearance of patient (above) before and (below) after alveolectomy and insertion of dentures.

May 8, a partial upper and a full lower denture were constructed.

The width of the maxillary incisors was 2 mm. less than that of the normal teeth, and the appearance was greatly improved.

The advantages to the patient were multiple. To mention a few: There was marked improvement in facial contour and expression, and the dentures were worn with comfort and efficiency from the time of insertion. The psychologic effect has been an improvement in the patient's outlook on life, giving her a great deal more confidence for the future.

First Huntington National Bank Building.

Impaction of a Third Molar Complicated by the Presence of an Impacted Supernumerary Molar

By A. L. RUSSELL, D.D.S., Philip, S. D.

A WOMAN, aged 28, applied for removal of a horizontally impacted mandibular molar, a carious cusp of which was visible. Roentgenograms revealed it to be a supernumerary

Impacted molar and supernumerary molar.

molar lying immediately above the third molar, which was likewise impacted horizontally. Removal of the teeth presented no unusual difficulty and recovery was uneventful.

Non-Vital Tooth

By ARTHUR LEVINSTEIN, D.D.S., Troy, N. Y.

A WOMAN, aged 37, complained of severe continuous headaches over a period of four months. Medical attention afforded no relief and previous dental examinations revealed no untoward conditions. Full-mouth x-ray films revealed no pathologic areas and none were visible clinically. There was no pain or tenderness over any of the teeth. The only non-vital tooth in the mouth, the

Non-vital maxillary incisor.

maxillary right central incisor, which had been restored with a Davis crown twenty years previously, was extracted, although the tooth clinically and roentgenographically showed no suspicious symptoms. Extraction cleared up the headaches.

44 Fourth Street.

Missing Lateral Incisor

By THEODORE KATZ, D.D.S., Bronx, New York, N. Y.

A GIRL, aged 14½ years, had no upper left lateral incisor and its place had been taken

Left cuspid in position of missing lateral incisor.

by the upper left cuspid. The upper left deciduous cuspid has remained in place and is still vital and firm.

2802 Grand Concourse.

CURRENT LITERATURE

Phylogenetic Growth Pattern of the Conical Forms of Teeth

By Fred Herzberg and Maury Massler

The teeth of several representative vertebrates were studied to determine their structure, incremental growth patterns and rates and gradients of growth. Growth increments were indicated by the lines of Retzius in the enamel and by the contour lines of Owen in the dentin. Rates and gradients of growth were measured by injecting the living animals with alizarin red S at intervals varying between thirty and fifty-seven days. The dye marks the dentin calcifying and forming at the time of injection by a red line easily recognizable in a ground section. The tooth conforms to the general laws of growth, particularly the laws of developmental direction and of differential growth. The same incremental pattern exists in all the conical tooth forms studied, and is a graphic diagram of tooth growth. The correlation between tooth growth and tooth form is shown in an analysis of growth rates and gradients. A classification of conical tooth forms is given.—*J. D. Res.*, 19:511, December 1940.

H. B. McCauley.

Medical Management of Fractures

By Charles F. Nelson and Roland C. Nelson

The authors give detailed therapeutic procedures for the medical management of fractures, including the use of calcium and phosphorus, parathyroid extract and H. D. and even measures for regulating the effects of hyperthyroidism with diiodotyrosine or iodine, the objectives being to establish a serum calcium level of from 10.5 to 12 mg. per hundred cubic centimeters and a serum phosphorus concentration of from 3.5 to 4 mg. per hundred cubic centimeters. Administration of dilute hydrochloric acid is recommended under certain conditions to facilitate the absorption of the calcium or phosphorus and as a means of keeping the urine acid, to prevent urolithiasis. With accurate medical management of fractures, excellent results are claimed by the authors.—*J.A.M.A.*, 116:184, January 1941.

N. Simmons.

Cereals and Rickets. XIII. Phytic Acid, Yeast Nucleic Acid, Soybean Phosphatides and Inorganic Salts as a Source of Phosphorus for Bone Calcification

By Carl H. Krieger, Rudolf Bunkfeldt, C. Ray Thompson and Harry Steenbock

The authors found that the phosphorus of yeast nucleic acid and soybean phosphatides was as readily available for calcification of bone as inorganic phosphorus. This stands in marked contrast with the availability of the phosphorus of phytic acid, which is not readily available. By the addition of vitamin D, the utilization of the phosphorus of phytic acid was increased in greater measure than that of the other forms of phosphorus, but it was still a less effective source product of good bone than the other sources.—*J. Nutrition*, 21:3, January 1941.

E. C. Woods.

Effect of Alkalosis on the Relationship Between Serum Calcium and Protein in Vivo

By Herman Yannet

The author has determined the relationship between calcium and protein in cats, in the presence of a marked degree of alkalosis. There was considerable hypocalcemia, presumably due to the marked reduction of the calcium ion concentration. Hyperphosphatemia was also found.—*J. Biol. Chem.*, 137:409, January 1941.

W. F. Koss.

Anesthesia for Major Dental Surgery

By William W. Mushin

The technic described in this article is an alternative to the well-established pernasal endotracheal inhalation anesthesia. A technic has been evolved in which two tubes of as large a bore as possible are passed one through each nostril. The ends of these

tubes lie just beyond the epiglottis and opposite the glottis. The pharynx or mouth is packed with gauze and conditions are established having the advantages of the endotracheal method without most of its disadvantages.

There are certain contraindications, mainly in reference to anatomic conditions sometimes found. Although endotracheal anesthesia has many advantages in major oral surgery, the frequency of postoperative sore throat should restrict its use to those cases in which it is considered indispensable.—*Brit. M. J.*, 1:46, January 11, 1941.

JAMES STRIEGEL.

Low Calcium Rickets in the Guinea Pig

By P. R. HOWE, L. G. WESSON, P. E. BOYLE and S. B. WOLBACH

TWENTY-ONE guinea pigs were placed on a diet of dextrin, casein, dried yeast, butter fat and calcium-free salts, supplemented by lettuce, ascorbic acid and carotene; the whole having a phosphorus:calcium ratio of 6. Nine animals that survived more than forty-four days are the subjects of the report. The teeth exhibited extreme enamel hypoplasia and areas of complete failure of enamel deposition. Masses of calcium-free enamel matrix were noted. The dentin showed irregular calcification and a dentinoid margin two to five times normal width. Rachitic changes in immature bones were typical.—*Proc. Soc. Exper. Biol. & Med.*, 45:298, October 1940.

H. B. MCCAULEY.

Histologische Studien Ueber die Einfluss der Speichel-Druesen-Extirpation auf die Wirkung des Geschlechtshormones

By T. HIGASHIJO

THE parotid glands of forty-six rats (of 60 to 120 gm. weight) were ligated and the submaxillary glands removed. Each rat was then injected subcutaneously with 10 mouse units of estrone per gram of body weight twice a week and compared with thirty-seven control rats receiving the same amount of hormone. Growth lagged in the control group, stopping at 245 gm. The hypophysis in female controls averaged 20 mg. after fifty days and 33 mg. after 120 days, but only 15 mg. in the females operated on, after from 129 to 231 days. In rats operated on, distinct histologic changes appeared in the hypophysis parathyroids, thyroids and bones. The testes, thymus and spleen were atrophic, and the suprarenal cortex and uterus were hypertrophic. Fibrosis occurred in the medulla of the maxillary bones. Tibiae of young rats operated on had thickened epiphyseal cartilage containing hypertrophic cartilage cells. In older rats, the cartilage tended to *Schleissung*.

The corpus luteum atrophied in young rats (of 60 to 90 gm. weight) with the submaxillary glands alone removed plus hormone injections, but throve in those without the hormone. The testes showed little difference. After sixty days, the hypophyses of rats operated on and given estrone averaged 9 mg. In those not given estrone, the hypophysis averaged 5 mg. With estrone, the thymus was atrophic, the suprarenals were hypertrophic and the tibia became enlarged and its epiphyses elongated.—*Soc. Path. Jap. Tr.*, 30:252, 1940. (Biol. Abstr.)

MARTIN DEAKINS.

Facial Bone Structure in Relation to Fractures

By WARWICK JAMES and B. W. FICKLING

FRACTURES of the jaws rarely pass through a tooth socket because of the great resistance offered by the dense cylinder of bone surrounding the tooth as compared with that of the ordinary medullary bony structure of the jaws. Exceptions occur when the blow is directed immediately on the teeth or adjacent bone or the socket is incomplete or the tooth unerupted. Bones of the face are so constructed as to efficiently oppose the forces of mastication, but have little resistance to forces applied in other directions. A knowledge of the probable lines of fracture is necessary to treatment.—*Brit. M. J.*, 2:789, December 7, 1940.

H. B. MCCAULEY.

Optimum Calcium Requirement

By J. HARRIS

BLOOD examinations in fifty-one cases admitted to the Liverpool Heart Hospital, and selected at random, showed that only four cases had a serum calcium below normal (9 mg. per hundred cubic centimeters). Careful inquiries into the home diets of a large number of patients revealed no in-

stances in which there was a calcium intake below the minimal requirement of 0.45 gm. daily, and, in most cases, it was several times higher. Over a period of years, it was impossible to find one case of a lesion entirely the result of a calcium deficiency.

On the other hand, the high incidence of kidney disorders, arteriosclerosis and heart disease may be evidence that large sections of the population are using a diet too rich in calcium. There may be indications for reducing the food calcium, but none for increasing it.—*Brit. M. J.*, 1:49, January 11, 1941.

H. B. McCAULEY.

Secretion of Intravenously Injected Fluorine in the Submaxillary Saliva of Cats

By J. H. WILLS

THE purpose of this paper was to investigate the passage of fluorine and chlorine from the blood to the saliva. It was found that radioactive fluorine injected intravenously into cats appeared in the saliva in significant quantity within one minute. An average of 0.082 per cent of the fluorine entered the saliva during the twenty-one minutes following the injection, and an average of 0.365 per cent of the radioactive chlorine was excreted in the saliva within twenty-three minutes. In resting cats, the gland being stimulated fifty minutes after the injection of the fluorine, an average of 0.020 per cent of the fluorine was excreted in the saliva during the twenty-one minutes following the beginning of stimulation. It was found that the ratio of fluorine in saliva to that in plasma was on the average 0.098 and a similar ratio for chlorine was 0.389.—*J. D. Res.*, 19:585, December 1940.

JAMES T. GINN.

Studies on Relief on Pain by Counterirritation

By G. F. GAMMON and I. STARR

THE author studied the relief of pain by counterirritation of various types, such as heat, cold, electric current, vibration and tactile stimulation. Regardless of the type of pain or counterirritant, the application of a counterirritant caused temporary relief, and its removal was also followed by temporary relief. As periodic counterirritant gave maximum relief from pain, it is probable that better results could be obtained clinically by careful selection and application of counterirritants.—*J. Clin. Investigation*, 20:13, January 1941.

W. F. KOSS.

Inhibitory Effect of Quaternary Ammonium Synthetic Detergent on Metabolism of Dental Plaque Material

By B. F. MILLER, J. A. MUNTZ and SIGMUND BRADEL

WHEN suspended in glucose solution and incubated with 1:3000 quaternary ammonium wetting and detergent compound (alkyldimethylbenzyl ammonium chloride), dental plaque material produced no acid. In a different experiment, a 1:500 solution of the detergent was applied to a plaque in the mouth for two minutes. Ten minutes later, the plaque material was removed and incubated, as before, in a glucose solution. No appreciable acid was obtained.—*Proc. Soc. Exper. Biol. & Med.*, 45:104, October 1940.

H. B. McCAULEY.

Eosinophile Leukocytes in the Pulp and Gingiva

By BALINT ORBAN

THE eosinophil leukocyte is found in rather large numbers in chronic inflammations of the pulp and gingiva, and, at times, it is found in acute inflammatory conditions. These cells migrate from the blood vessels into the tissue, probably being attracted through some chemotactic influence. It has been noted that the eosinophil leukocytes are usually numerous in allergic conditions, and it is suggested that possibly allergic conditions develop in the pulp and gingiva as a result of the frequent hemorrhage and tissue decomposition that go on in these tissues. The action of the eosinophil is still unknown.—*J. D. Res.*, 19:537, December 1940.

E. C. WOODS.

Ueber den Einfluss der Innern Sekretion der Speicheldruese auf der Zahns

By M. HUKUSIMA

REMOVAL of both the parotid and the submaxillary glands of fifteen rats (of 50 to 85 gm. weight) increased the percentage having molar caries to 100 per cent in from

thirty-five to seventy days. Only six of twelve control rats had caries. The outer layer of dentin contained more interglobular spaces. The inner zone manifested widened and irregular tubules. The predentinal zone was thicker, especially in the roots, and the odontoblasts were degenerated and contained pyknotic nuclei. The periodontium was generally more vascular, with dilated capillaries. Resorption of the molar roots and cementum and alveolar process occurred. The alveolar bone had enlarged haversian and Volkmann canals, especially in septal regions. Removal of only the submaxillary glands from nineteen rats resulted in a thicker dentinal layer, thicker cementum with fewer cells and more intercellular substance and a sclerotic alveolar process. The tissue of the remaining parotids was also sclerotic. Thirteen control rats were used. Caries was most frequent in the second molar of both groups of experimental animals. The author concludes that development and growth of dental tissues are closely related to an inner secretion of the salivary glands.—*Soc. Path. Jap. Tr.*, **30**:245, 1940. (Biol. Abstr.)

MARTIN DEAKINS.

Capacity of Developing Tooth Germ Elements for Self-Differentiation When Transplanted

By WILLIAM E. HAHN

THE relationship of the various embryonic tissues associated in tooth formation in dogs was investigated by the autogenous transplant method. It was found that when the odontoblast-pulp tissue was grafted onto the ovary, the odontoblasts retained their cell characteristics and produced histologically normal tubular dentin after fifteen days' implantation. Transplants of the isolated enamel epithelium (enamel organ) showed on recovery of the tissue, seven days after implantation, that the enamel organ had lost its definitive form and survived as solid islands and strands of basosquamous epithelium. The presence of this epithelium failed to induce any osteogenic changes in the connective tissue cells of the ovary suggestive of bone formation. After fifteen days' implantation, large epithelial cysts were formed, histologically similar to the simple epithelial cysts occurring in human jaws. When the odontoblasts were removed from the pulp cells and this denuded mass of tissue was combined with the enamel organ, in pulp-ameloblast relation, and transplanted, it was found, at seven days, that the enamel epithelium failed to survive, as such, but changed to the basosquamous type, which subsequently formed epithelial cysts similar to those noted in the previous experiment. In no instance was it possible to observe that the surrounding enamel organ exerted any changes in the peripheral connective tissue cells of the pulp; which would indicate their transformation into active odontoblasts. It is suggested that the failure of the enamel epithelium to initiate odontoblast formation was due to the fact that once the ameloblasts begin the production of enamel, they are no longer capable of influencing connective tissue cells.—*J. D. Res.*, **20**:5, February 1941.

VIRGIL D. CHEYNE.

Fractures of the Jaw: Surgical and Dental Treatment

By A. H. MCINDOE

ON this review of 119 cases of jaw fracture and treatment at an emergency medical service maxillofacial unit from the outbreak of war to the end of 1940, most of the cases were among fit young men in active service, who received their injuries as a result of war. Primary treatment consisted of cleansing the wound, removing foreign bodies and non-viable bone, establishing drainage and suturing. This was done by the plastic surgeon. The immobilization of bone fragments and clearing up of sepsis in the fracture lines fell to the lot of the dental surgeon. —*Brit. M. J.*, 1:209, February 8, 1941.

H. B. MCCAULEY.

Histopathological Studies on the Teeth of Lepers, Especially on the Dental Pulp and Gingival Tissues

By T. ITAKURA

DENTAL tissues from eighty-four necropsies in cases of leprosy were studied. Leprous infection was found in the pulps of 115 of 353 non-carious teeth. Calcareous and lipid deposits were found in the leprous cells, odontoblasts, pulp cells, vessel walls and nerve fibers. *Bacillus leprae* occurred in twenty-two of eighty-three teeth, usually in

the basal substance and lumina of blood vessels. Nine of the eighty-four cadavers had colored teeth (ten of the 353 teeth). The color appeared more frequently in the anterior teeth and varied from pink to purple. No macroscopic change was evident in the gingivae, but microscopic changes were found in the gingival subepithelium. The gingival epithelium was unaffected. No acid-fast bacilli were found in the pus in "lepric pyorrhea." Tubercular leprosy involves the dental tissues much more frequently than the neural type.—*Soc. Path. Jap. Tr.*, **30**: 357, 1940. (Biol. Abstr.)

MARTIN DEAKINS.

Repair of Facial Defects with Prosthesis, Using a Latex Compound

By ARTHUR H. BULBULIAN

THE purpose of prosthetic restorations about the face and mouth may be (1) esthetic, (2) functional or (3) both esthetic and functional. Aside from harelip and its complications, the most frequent types of deformities for which prosthetic restoration may be indicated are (1) partial or total loss of the nose and (2) partial or total loss or congenital absence of the auricle. Consideration is given to the two main groups of such materials: (1) rigid, such as vulcanite, metals and celluloid, and (2) flexible, such as mixtures of gelatin and glycerine and soft rubber. By a recent process of treating latex, it has been made possible to obtain rubber in liquid form which can be poured into a mold. On drying at room temperature or higher, the liquid rubber is converted into a highly elastic, soft, pliable rubber. This is compatible with tissues and can be used in making prosthetic restorations of the nose and ear.—*Mil. Surgeon*, **88**:179, February 1941.

JAMES STRIEGEL.

Vincent's Infection: Retrospect, Suspect and Prospect

By F. D. FRANCIS

THE failure of the term "ulcerative gingivitis" to indicate any etiologic agent resulted in empiric treatment for any condition of the gingiva involving destruction of the gingival tissues. The association of the spirochete and the fusiform bacillus with these particular cases permitted more specific modes of treatment. In addition, the author maintains that the typical case in the past was of an acute nature with constitutional symptoms. Today, few such cases occur, being of a chronic or a subacute nature with no systemic symptoms. Further, the presence of a fungus results in keeping the inflammatory process active, interferes with nutrition and prevents natural tissue resistance from asserting itself.

In routine methods of treatment of new and recurrent cases, copper sulfate is used as a fungicide.—*D. J. Australia*, **13**:133, March 1941.

E. C. WOODS.

Endemic Fluorosis in South India. A Study of Factors in the Production of Mottled Enamel in Children and Severe Bone Manifestations in Adults

By C. G. PANDIT ET AL.

IN a three-year study of the picture involved in the production of mottling of enamel in children and severe bone manifestations in adults as a result of ingestion of fluorides in drinking water in certain areas of south India, it was found that:

1. Mottled enamel was universally present in children where the drinking water contained 1 part per million or more of fluorine. The severity was proportional to the fluoride content.

2. Deciduous teeth were also affected in areas with a high fluoride content and severe type of mottling.

3. A certain area containing fluorite or fluorapatite as a constituent in its rocks showed the highest fluoride content in the drinking water (6 parts per million) and severe chronic fluorosis with bone and joint manifestations occurred in this area.

4. More than fifteen years' residence in this area was necessary in the case of adults to elicit these symptoms.

5. Disparities were noted in areas where the fluoride content was identical.

6. The incidence and severity of the disease had a definite relationship to the economic and nutritional status of the communities.

7. Vitamin C deficiency especially was associated with a high incidence.—*Indian J. M. Res.*, **28**:533, October 1940.

N. S. SIMMONS.

ANNOUNCEMENTS

ANNOUNCEMENTS must be received by the fifth day of the month in order to be published in the forthcoming issue of THE JOURNAL.

CALENDAR OF MEETINGS

ACADEMY OF ANESTHESIOLOGY and NATIONAL SOCIETY OF DENTAL ANESTHETISTS, New York, May 21.

AKRON (OHIO) DENTAL SOCIETY, May 14.

AMERICAN ASSOCIATION OF ORTHODONTISTS, New York, N. Y., May 5-8.

AMERICAN BOARD OF ORTHODONTICS, New York, N. Y., May 3.

AMERICAN DENTAL ASSISTANTS ASSOCIATION, Houston, Texas, October 27-31.

AMERICAN DENTAL ASSOCIATION, Houston, Texas, October 27-31.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION, Houston, Texas, October 27-31.

AMERICAN PUBLIC HEALTH ASSOCIATION, Atlantic City, N. J., October 14-17.

ASSOCIATION OF FRENCH SPEAKING DENTISTS OF NORTH AMERICA, Quebec, Canada, June 5-7.

CLEVELAND DENTAL SOCIETY, Cleveland, Ohio, May 5-7.

DISTRICT OF COLUMBIA DENTAL SOCIETY, second and fourth Tuesdays in each month from October to June at the United States Public Health Service Auditorium, Washington.

LATIN AMERICAN CONGRESS FOR PLASTIC SURGERY, Rio de Janeiro and S. Paulo, July 6-12.

MEDICO-CHIRURGICAL COLLEGE CLASS OF 1916, Philadelphia, May 21.

MEXICAN ORTHODONTISTS ASSOCIATION, Mexico City, June 23-28.

NATIONAL BOARD OF DENTAL EXAMINERS, May 5-6.

NATIONAL DENTAL ASSOCIATION, Richmond, Va., August 11-15.

NEW YORK UNIVERSITY COLLEGE OF DENTISTRY CLASS OF 1921, New York, N. Y., May 22.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA, Pittsburgh, November 11-13.

ONTARIO DENTAL ASSOCIATION, Toronto, May 19-21.

PACIFIC COAST DENTAL CONFERENCE, Portland, Ore., July 7-11.

DENTAL ALUMNI SOCIETY, UNIVERSITY OF PENNSYLVANIA, Philadelphia, May 22-24.

PHILADELPHIA DENTAL COLLEGE ALUMNI SOCIETY, Philadelphia, Pa., May 21-22.

SOUTHERN SOCIETY OF ORTHODONTISTS, Raleigh, N. C., September 29-30.

WESTERN RESERVE DENTAL ALUMNI ASSOCIATION, Cleveland, Ohio, June 9.

STATE SOCIETIES

May

Arkansas, at Fort Smith (19-21)
Georgia, at Savannah (19-21)
Illinois, at Peoria (12-15)
Indiana, at Indianapolis (19-21)
Iowa, at Des Moines (5-7)
Louisiana, at New Orleans (1-3)
Maryland, at Baltimore (5-6)
Missouri, at St. Joseph (4-7)
Montana, at Missoula (1-3)
Nebraska, at Omaha (12-14)
New Jersey, at Asbury Park (7-9)
New York, at Buffalo (12-16)
North Carolina, at Pinehurst (12-14)
North Dakota, at Fargo (12-14)
South Carolina, at Columbia (5-6)
Tennessee, at Knoxville (12-15)
Virginia, at Old Point Comfort (8-10)
West Virginia, at White Sulphur Springs (19-21)

June

Colorado, at Colorado Springs (19-21)
Idaho, at Sun Valley
Maine, at Portland (26-28)
Mississippi, at Biloxi (9-11)
Nevada, at Reno (7)
New Hampshire, at New London (22-24)
New Mexico, at Albuquerque
Pennsylvania, at Bedford (3-5)
South Dakota, at Rapid City (15-17)
Utah, at Salt Lake City (26-28)
Wyoming, at Cody

July

Washington, at Portland

September

Southern California, at Los Angeles (8-10)
Hawaii, at Honolulu

November

Ohio, at Columbus

STATE BOARDS OF DENTAL EXAMINERS

Alabama, at Birmingham, June 23. W. A. Wood, Merchants Nat'l Bank Bldg., Mobile, Secretary.

Arkansas, at Little Rock, June 23-26. Clarence W. Koch, 817 Donaghey Bldg., Little Rock, Secretary.

California, at San Francisco, May 19, and at Los Angeles, June 16. Kenneth I. Nesbitt, 515 Van Ness Ave., San Francisco, Secretary.

Connecticut, at Hartford, June 24-28. Clarence G. Brooks, New London, Recorder.

Delaware, at Wilmington, June 17-20. Charles R. Jefferis, Medical Arts Bldg., Wilmington, Secretary.

Florida, at Jacksonville, June 23-27. H. B. Pattishall, 351 St. James Bldg., Jacksonville, Secretary.

Georgia, at Atlanta, June 9-12. R. C. Coleman, Room 11, State Capitol, Atlanta, Secretary.

Indiana, at Indianapolis, June 3-7. D. Gordon Lamb, 819 Chamber of Commerce Bldg., Indianapolis, Secretary.

Kentucky, at Louisville, June 10-13. Leon M. Childers, 1312 First Nat'l Bank Bldg., Lexington, Secretary.

Maine, at Augusta, June 23-25. Carl W. Maxfield, 31 Central St., Bangor, Secretary.

Massachusetts, June 9-12. Francis M. Cahill, State House, Boston, Secretary.

Mississippi, at Jackson, June 17. G. L. Clement, Pontotoc, Secretary.

Montana, at Helena, July 14. Leonard A. Jenkin, 401 Ford Bldg., Great Falls, Secretary.

Nebraska, at Omaha and Lincoln, June 16-21. Henry A. Merchant, Medical Arts Bldg., Omaha, Secretary.

New Jersey, June 23-28. W. A. Wilson, 148 W. State St., Trenton, Secretary.

New Mexico, at Santa Fe, June 23-26. J. J. Clarke, Sr., Artesia, Secretary.

North Carolina, at Raleigh, June 23. Wilbert Jackson, Rich Bldg., Clinton, Secretary.

North Dakota, at Fargo, July 7-10. L. I. Gilbert, 401 Black Bldg., Fargo, Secretary.

Ohio, at Columbus, June 23. Earl D. Lowry, 79 E. State St., Columbus, Secretary.

Oklahoma, at Oklahoma City, June 16-19. W. T. Longwell, 1st National Bank Bldg., Frederick, Secretary.

Oregon, at Portland, June 9-13. Arthur F. Weeks, Selling Bldg., Portland, Secretary.

Pennsylvania, at Philadelphia and Pittsburgh, June 17-21. Reuben E. V. Miller, 61 N. Third St., Easton, Secretary.

South Dakota, at Rapid City, June 18-21. C. H. Boyden, Mitchell, Secretary.

Texas, at Dallas, June 16-20. B. Carl Holden, Nixon Bldg., Corpus Christi, Secretary.

Vermont, at Montpelier, June 23-25. C. I. Taggart, Burlington, Secretary.

West Virginia, at Charleston, June 23. Henry C. Hill, Charleston, Secretary.

Wisconsin, at Milwaukee, June 16-20. S. F. Donovan, Tomah, Secretary.

ACADEMY OF ANESTHESIOLOGY AND NATIONAL SOCIETY OF DENTAL ANESTHETISTS

THE Academy of Anesthesiology and the National Society of Dental Anesthetists will meet in the Medical Arts Auditorium, 57 W. 57th St., New York, May 21, at 8:30 p.m.

S. DANIEL SELDIN,
57 W. 57th St.,
New York.

AMERICAN ASSOCIATION OF ORTHODONTISTS

THE thirty-ninth meeting of the American Association of Orthodontists will be held at the Waldorf Astoria Hotel in New York, N. Y., May 5-8.

MAX E. ERNST, *Secretary,*
1250 Lowry Medical Arts Bldg.,
St. Paul, Minn.

AMERICAN BOARD OF ORTHODONTICS

A MEETING of the American Board of Orthodontics will be held at the Waldorf-Astoria Hotel, New York, N. Y., May 3. Orthodontists who desire to obtain certificates of qualification from the board should secure application blanks from the secretary. Applications must be in at least sixty days

before the meeting. For further information, address

CHARLES R. BAKER, *Secretary,*
636 Church St.,
Evanston, Ill.

AMERICAN DENTAL ASSISTANTS ASSOCIATION

THE seventeenth annual session of the American Dental Assistants Association will be held in Houston, Texas, October 27-31. For further information, address

AILEEN M. FERGUSON,
General Secretary,
709 Centre St.,
Jamaica Plain, Mass.

AMERICAN DENTAL HYGIENISTS' ASSOCIATION

THE eighteenth annual meeting of the American Dental Hygienists' Association will be held in Houston, Texas, October 27-31.

A. REBEKAH FISK, *Secretary,*
General Dispensary, U. S. Army,
Washington, D. C.

AMERICAN PUBLIC HEALTH ASSOCIATION

THE seventieth annual meeting of the American Public Health Association will be held in Atlantic City, N. J., October 14-17. Headquarters, Convention Hall; residence headquarters, Hotel Traymore.

WILLIMINA RAYNE WALSH,
Associate Secretary,
1790 Broadway,
New York, N. Y.

ASSOCIATION OF FRENCH SPEAKING DENTISTS OF NORTH AMERICA

THE Association of French Speaking Dentists of North America will hold its annual convention at Chateau Frontenac, Quebec, Canada, June 5-7.

VIGER PLAMONDON, *Secretary,*
606 Rue St. Jean,
Quebec.

LATIN AMERICAN CONGRESS FOR PLASTIC SURGERY

THE first Latin American Congress for Plastic Surgery will be held in Rio de Janeiro and S. Paulo, July 6-12.

ANTONIO PRUDENTE, *Chairman.*

MEDICO CHIRURGICAL COLLEGE (UNIVERSITY OF PENNSYLVANIA) CLASS OF 1916

THE twenty-fifth anniversary reunion and banquet for the class of 1916, Medico Chirurgical College, will be held Wednesday night, May 21, at the Walton Hotel, Philadelphia. For further information, address

A. H. WITTMANN, *Secretary,*
6722 Woodland Ave.,
Philadelphia, Pa.

CLEVELAND DENTAL SOCIETY

THE Spring Clinic Meeting of the Cleveland Dental Society will be held May 5-7 at the Statler Hotel, Cleveland.

IRWIN F. STEUER, *Chairman,*
Publicity Committee,
308 Republic Bldg.,
Cleveland, Ohio.

MEXICAN ORTHODONTISTS ASSOCIATION

THE Third Medicodental Convention of the Mexican Orthodontists Association will be held in Mexico City, June 23-28, at the School of Dentistry of the National University of Mexico. Members of the American Dental Association are welcome.

S. FASTLICHT, *Secretary,*
Madero 40,
Mexico City.

NATIONAL BOARD OF DENTAL EXAMINERS

THE National Board of Dental Examiners will hold its next session for the examination of candidates in Parts I and II, May 5-6, in schools where there are five or more candidates. For further information and application blanks, address

MORTON J. LOEB, *Secretary,*
66 Trumbull St.,
New Haven, Conn.

NATIONAL DENTAL ASSOCIATION

THE National Dental Association will convene for the twenty-eighth annual session August 11-15, in Richmond, Va. For further information, address

J. A. JACKSON, *Secretary,*
Charlottesville, Va.

NEW YORK UNIVERSITY COLLEGE OF DENTISTRY CLASS OF 1921

THE twentieth reunion of the Class of 1921 of the New York University College

of Dentistry will be held May 22 at 7 p.m. at the Hotel Pennsylvania, New York. For reservations, call or write

JEROME H. TRIER,
993 Park Ave.,
New York.

ODONTOLOGICAL SOCIETY OF WESTERN PENNSYLVANIA

THE annual meeting of the Odontological Society of Western Pennsylvania will be held November 11-13 at the William Penn Hotel, Pittsburgh.

W. EARLE CRAIG, *Secretary,*
206 Jenkins Bldg.,
Pittsburgh.

ONTARIO DENTAL ASSOCIATION

THE Seventy-Fourth Annual Convention of the Ontario Dental Association will be held at the Royal York Hotel, Toronto, Ontario, May 19-21. Dentists from the United States and from all parts of Canada will be welcome.

FRED J. CONBOY, *Secretary,*
86 Bloor St., West,
Toronto.

PACIFIC COAST DENTAL CONFERENCE

THE sixth triennial Pacific Coast Dental Conference will be held in Portland, Ore., July 7-11.

A. F. WEEKS, *Secretary,*
Selling Bldg.,
Portland, Ore.

DENTAL ALUMNI SOCIETY, UNIVERSITY OF PENNSYLVANIA

THE Dental Alumni Society of the University of Pennsylvania will meet May 22 for a golf tournament. For details, write to Sanford D. Lawyer, Germantown Professional Bldg., Germantown, Pa. Friday, May 23, the annual meeting of the dental alumni society will be held in the Evans Institute, at 10 a.m., followed by luncheon with the society as host. An exhibit of teaching in the school will be given by members of the faculty. The annual dinner will be given at the Hotel Benjamin Franklin at 6:30 ($3 per cover). Saturday, May 24, will be general alumni day, at River Field, with dedication of the "Mike" Murphy Field House; lacrosse, Cornell vs. Pennsylvania; baseball, Princeton vs. Pennsylvania.

Z. T. JACKAWAY, *Secretary,*
1506 E. Susquehanna Ave.,
Philadelphia.

ALUMNI SOCIETY OF THE PHILADELPHIA DENTAL COLLEGE, TEMPLE UNIVERSITY

THE seventy-eighth annual session of the Alumni Society of the Philadelphia Dental College, Temple University, will be held May 21-22. For further information, address

DAVID K. WALDMAN,
Publicity Chairman,
Central Medical Bldg.,
Philadelphia.

SOUTHERN SOCIETY OF ORTHODONTISTS

THE next meeting of the Southern Society of Orthodontists will be held in Raleigh, N. C., September 29-30.

T. C. SPARKS, *Secretary,*
Medical Arts Bldg.,
Columbia, S. C.

WESTERN RESERVE DENTAL ALUMNI ASSOCIATION

THE Western Reserve Dental Alumni Association announces its annual Alumni Day at the School of Dentistry, June 9, with dinner and class reunion at the Mid Day Club, 6:30 p.m.

JOSEPH R. GOULD,
630 Rose Bldg.,
Cleveland, Ohio.

SOUTHERN CALIFORNIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Southern California State Dental Association will be held September 8-10 at the Los Angeles Biltmore Hotel.

FRANCIS J. CONLEY, *Secretary,*
804 Professional Bldg.,
Los Angeles.

GEORGIA DENTAL ASSOCIATION

THE seventy-third annual meeting of the Georgia Dental Association will be held at Savannah, May 19-21, with headquarters at the Hotel DeSoto.

R. H. MURPHY, *Secretary,*
Macon.

ILLINOIS STATE DENTAL SOCIETY

THE next annual meeting of the Illinois State Dental Society will be held in Peoria, May 12-15.

L. H. JACOB, *Secretary,*
Jefferson Bldg.,
Peoria.

LOUISIANA STATE DENTAL SOCIETY

THE sixty-first annual meeting of the Louisiana State Dental Society will be held May 1-3, at the Roosevelt Hotel, New Orleans.

JULIAN S. BERNHARD, *Secretary,*
417 Medical Arts Bldg.,
Shreveport.

MISSOURI STATE DENTAL ASSOCIATION

THE Missouri State Dental Association will hold its next meeting in St. Joseph, May 4-7.

C. W. DIGGS, *Secretary,*
Exchange National Bank Bldg.,
Columbia.

MONTANA STATE DENTAL ASSOCIATION

THE thirty-eighth annual session of the Montana State Dental Association will be held in Missoula, May 1-3.

T. T. RIDER, *Secretary,*
9 Higgins Block,
Missoula.

NEW HAMPSHIRE DENTAL SOCIETY

THE next meeting of the New Hampshire Dental Society will be held June 22-24, at Soo-Nipi Park Lodge, New London.

FLOYD E. WILLIAMS, *Secretary,*
814 Elm St.,
Manchester.

NEW JERSEY STATE DENTAL SOCIETY

THE next annual meeting of the New Jersey State Dental Society will be held in Asbury Park, May 7-9, at the Berkeley Carteret Hotel.

F. K. HEAZELTON, *Secretary,*
223 E. Hanover St.,
Trenton.

DENTAL SOCIETY OF THE STATE OF NEW YORK

THE Dental Society of the State of New York will convene in Buffalo for its seventy-third annual meeting, May 12-16, at the Statler Hotel. Members of the American Dental Association and the Canadian Dental Association are invited.

LEON J. GAUCHAT, *Chairman,*
Press and Publications,
333 Linwood Ave.,
Buffalo.

PENNSYLVANIA STATE DENTAL SOCIETY

THE seventy-third annual meeting of the Pennsylvania State Dental Society will be held at the Bedford Springs Hotel, Bedford, June 3-5.

C. J. HOLLISTER,
Executive Secretary,
217 State St.,
Harrisburg.

SOUTH CAROLINA STATE DENTAL ASSOCIATION

THE seventy-first annual meeting of the South Carolina State Dental Association will be held in Columbia, May 5-6, with headquarters at the Wade Hampton Hotel.

P. B. HAIR, *Secretary,*
Spartanburg.

SOUTH DAKOTA STATE DENTAL SOCIETY

THE fifty-ninth annual session of the South Dakota Dental Society will be held at Rapid City in the Black Hills, June 15-17.

ERNEST W. ELMEN, *Secretary,*
Sioux Falls.

TENNESSEE STATE DENTAL ASSOCIATION

THE seventy-fourth annual meeting of the Tennessee State Dental Association will be held at the Hotel Andrew Johnson, Knoxville, May 12-15.

HOWARD M. TAYLOR, *Secretary,*
206 Medical Arts Bldg.,
Knoxville.

VIRGINIA STATE DENTAL ASSOCIATION

THE next annual meeting of the Virginia State Dental Association will be held at the Chamberlain Hotel, Old Point Comfort, May 8-10.

J. E. JOHN, *Secretary,*
Medical Arts Bldg.,
Roanoke.

BOARD OF DENTAL EXAMINERS OF ALABAMA

THE Board of Dental Examiners of Alabama will conduct its next annual dental examination beginning June 23, in Birmingham. All credentials must be filed with the secretary at least two weeks in advance of

the examination. Address all correspondence to

W. A. WOOD, *Secretary,*
Merchants Nat'l Bank Bldg.,
Mobile.

ARKANSAS STATE BOARD OF DENTAL EXAMINERS

THE Arkansas State Board of Dental Examiners will conduct the next examination of applicants for dental licensure at Little Rock, June 23-26. All applications must be filed with the secretary not later than June 10.

CLARENCE W. KOCH, *Secretary,*
817 Donaghey Bldg.,
Little Rock.

STATE OF CALIFORNIA BOARD OF DENTAL EXAMINERS

THE next examination of the Board of Dental Examiners of California for license to practice dentistry and for license to practice dental hygiene in the State of California will be held in San Francisco, commencing May 19, at the Physicians & Surgeons College of Dentistry, 344 Fourteenth St., and the University of California, College of Dentistry, Third and Parnassus Ave. There will also be an examination in Los Angeles in Room 804, City Hall, and the University of Southern California, College of Dentistry, 122 E. Sixteenth St., commencing June 16. All credentials must be in the office of the secretary, Room 203, 515 Van Ness Ave., San Francisco, at least twenty days prior to the date of any examination. Address all communications to Kenneth I. Nesbitt, Secretary.

CONNECTICUT DENTAL COMMISSION

THE Connecticut Dental Commission will meet in Hartford, June 24-28, for the examination of applicants for license to practice dentistry and dental hygiene and to transact any other business proper to come before it. Applications must be in the hands of the recorder at least ten days before the meeting. For application blanks and further information, apply to

CLARENCE G. BROOKS, *Recorder,*
New London.

DELAWARE STATE BOARD OF DENTAL EXAMINERS

THE examination of dental and oral hygienist candidates will be held at the Delaware Hospital, Wilmington, June 17-20.

CHARLES R. JEFFERIS, *Secretary,*
Medical Arts Bldg.,
Wilmington.

FLORIDA STATE BOARD OF DENTAL EXAMINERS

THE Florida State Board of Dental Examiners will hold its annual examination of applicants for license to practice dentistry and dental hygiene in Florida at Jacksonville in the Seminole Hotel, June 23-27. Preliminary applications must be filed by April 23. Final application for examinations in dentistry and in dental hygiene must be complete by May 23. Address all communications to

H. B. PATTISHALL, *Secretary,*
351 St. James Bldg.,
Jacksonville.

BOARD OF DENTAL EXAMINERS OF GEORGIA

THE Georgia Board of Dental Examiners will meet June 9-12 at the State Capitol. For application blanks, address

R. C. COLEMAN, *Joint Secretary,*
Room 111, State Capitol,
Atlanta.

INDIANA STATE BOARD OF DENTAL EXAMINERS

THE next examination for licensure of the Indiana State Board of Dental Examiners will be held in Indianapolis beginning June 3 and continuing four days. All applications, fees and credentials positively must be in the hands of the secretary not later than ten days prior to the beginning of the examinations. For applications, instructions and other information, address

D. GORDON LAMB, *Secretary,*
819 Chamber of Commerce Bldg.,
Indianapolis.

KENTUCKY STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Kentucky State Board of Dental Examiners will be held June 10-13, at the University of Louisville, Dental School, Louisville. Dentists having graduated prior to 1941 and desiring to stand examination before this board must have filed applications, complete with full information requested, at this office not later than

April 10. Applications of 1941 graduates must be in our file by May 30. Ample time should be allowed for securing all data required. For application forms and further information, apply to

LEON M. CHILDERS, *Secretary,*
1312 First Nat'l Bank Bldg.,
Lexington.

MAINE STATE BOARD OF DENTAL EXAMINERS

THE next meeting of the Maine State Board of Dental Examiners will be held June 23-25 at the State House, Augusta. Applications with necessary fee must be in the hands of the secretary at least ten days prior to the date of examination. Address all communications to

CARL W. MAXFIELD, *Secretary,*
31 Central St.,
Bangor.

MASSACHUSETTS BOARD OF DENTAL EXAMINERS

THE Massachusetts Board of Dental Examiners will hold its annual examinations June 9-12. All applications, with credentials, must be filed with the secretary at least thirty days in advance. For further information, address

FRANCIS M. CAHILL, *Secretary,*
State House,
Boston.

MISSISSIPPI STATE BOARD OF DENTAL EXAMINERS

THE Mississippi State Board of Dental Examiners will hold its next examination in Jackson beginning the third Tuesday in June. Applications should be in the hands of the secretary thirty days before the date of the meeting. For further information, address

G. L. CLEMENT, *Secretary,*
Pontotoc.

MONTANA STATE BOARD OF DENTAL EXAMINERS

THE regular annual meeting of the Montana State Board of Dental Examiners for the examination of applicants desiring to practice dentistry or dental hygiene will be held in Helena commencing July 14. Montana does not reciprocate with any of the other states or the territories. All applicants must be citizens of the United States and must have received a degree from a dental school in the United States offering a full four year course.

LEONARD A. JENKIN, *Secretary,*
401 Ford Bldg.,
Great Falls.

NEBRASKA STATE BOARD OF DENTAL EXAMINERS

THE Nebraska State Board of Dental Examiners will hold its next regular examination at Omaha and Lincoln, June 16-21. The practical examination will be given at Creighton University Dental School, Omaha, June 16-18; the theoretical, at the State House, Lincoln, June 20-21.

HENRY A. MERCHANT, *Secretary,*
Medical Arts Bldg.,
Omaha.

STATE BOARD OF REGISTRATION AND EXAMINATION IN DENTISTRY OF NEW JERSEY

THE State Board of Registration and Examination in Dentistry of New Jersey will hold its annual examinations, commencing June 23 and continuing for five days thereafter. On application to the secretary, a copy of the requirements and rules for applicants, instruction sheet and preliminary application blank will be sent. Any person desiring to apply as a candidate must file the preliminary application blank, together with the examination fee of $25, on or before March 15, for the succeeding June examinations or before September 1 for the succeeding December examinations.

W. A. WILSON, *Secretary,*
148 W. State St.,
Trenton.

NEW MEXICO BOARD OF DENTAL EXAMINERS

THE New Mexico Board of Dental Examiners will hold its next examination in Santa Fe, June 23-26. For further information, address

J. J. CLARKE, SR., *Secretary,*
Artesia.

NORTH CAROLINA STATE BOARD OF DENTAL EXAMINERS

THE next annual meeting of the North Carolina State Board of Dental Examiners for the examination of applicants for licensure will be held at the State Capitol, Raleigh, beginning June 23. Applications must

be filed with the secretary thirty days before the examination. For application blanks and further information, address

WILBERT JACKSON, *Secretary,*
Rich Bldg.,
Clinton.

NORTH DAKOTA STATE BOARD OF DENTAL EXAMINERS

THE North Dakota State Board of Dental Examiners will hold its next examination in the Gardner Hotel, Fargo, July 7-10. For information and application, address

L. I. GILBERT, *Secretary,*
401 Black Bldg.,
Fargo.

OHIO STATE DENTAL BOARD

THE next examination of the Ohio State Dental Board will be held the week beginning June 23. All applications must be in the hands of the secretary at least ten days before the date of examination. For further information, address

EARL D. LOWRY, *Secretary,*
79 E. State St.,
Columbus.

STATE OF OKLAHOMA DENTAL BOARD

THE Board of Governors of Registered Dentists of the State of Oklahoma will hold its next examination in Oklahoma City, June 16-19. Applications for examination in dentistry, dental hygiene and dental specialties must be received by June 10. Address all communications to

W. T. LONGWELL, *Secretary,*
1st National Bank Bldg.,
Frederick.

OREGON STATE BOARD OF DENTAL EXAMINERS

THE Oregon State Board of Dental Examiners will meet in Portland, June 9-13 for the purpose of examining applicants for license to practice dentistry in the state. Applications must be filed not later than May 24. For application blanks or additional information, address

ARTHUR F. WEEKS, *Secretary,*
Selling Bldg.,
Portland.

DENTAL COUNCIL AND EXAMINING BOARD OF THE COMMONWEALTH OF PENNSYLVANIA

THE Dental Council and Examining Board of the Commonwealth of Pennsylvania will conduct examinations in Philadelphia and Pittsburgh, June 17-21. For information and application blanks, address the Department of Public Instruction, Bureau of Professional Licensing, Dental Division, Harrisburg, or

REUBEN E. V. MILLER, *Secretary,*
61 N. Third St.,
Easton.

SOUTH DAKOTA BOARD OF DENTAL EXAMINERS

THE South Dakota State Board of Dental Examiners will hold its next examination at Rapid City, June 18-21. For information and applications, address

C. H. BOYDEN, *Secretary,*
Mitchell.

TEXAS BOARD OF DENTAL EXAMINERS

THE Texas Board of Dental Examiners will hold its next examination June 16-20 in Dallas. Applications must be filed at least ten days prior to the date of examination. For further information, address

B. CARL HOLDER, *Secretary,*
Nixon Bldg.,
Corpus Christi.

VERMONT STATE BOARD OF DENTAL EXAMINERS

THE Vermont State Board of Dental Examiners will meet June 23-25 in the State House, Montpelier, to examine applicants for license to practice dentistry and dental hygiene. All applications, accompanied by examination fee, must be in the hands of the secretary at least fifteen days before the date of the meeting. For applications and other information, address

C. I. TAGGART, *Secretary,*
Burlington.

WEST VIRGINIA BOARD OF DENTAL EXAMINERS

THE West Virginia State Board of Dental Examiners will hold its next examination at the Capitol Building, Charleston, beginning the fourth Monday in June. Applications should be in the hands of the secretary thirty days before the date of the meeting. For further information, address

HENRY C. HILL, *Secretary,*
Charleston.

WISCONSIN BOARD OF DENTAL EXAMINERS

THE next meeting of the Wisconsin Board

of Dental Examiners will be held at Marquette University Dental School June 16-20. Candidates having graduated prior to January 1 must have applications filed not later than May 15. Candidates who are 1941 graduates must have applications filed not later than June 1. For further information, address

S. F. DONOVAN, *Secretary,*
Tomah.

DENTAL INTERNSHIP

THE Utah State Hospital, Provo, wishes to procure a dental intern, preferably a resident of Utah graduating this spring. The internship is for a year or more of full-time service. For particulars, address

GARLAND H. PAGE, *Superintendent,*
Utah State Hospital,
Provo.

EXAMINATION FOR APPOINTMENT IN THE DENTAL CORPS OF THE NAVY

A COMPETITIVE examination to select candidates for appointment in the Dental Corps of the Navy will be held July 7 at the Naval Medical School, Washington, D. C., the Naval Training Station, Great Lakes, Ill., and the Naval Training Station, San Diego, Calif. A candidate for appointment in the Dental Corps must be a citizen of the United States, between 21 and 32 years of age at the time of appointment, and a graduate of a standard dental college. A circular which contains full information relative to the Dental Corps and describes the method of making application for appointment can be obtained from the Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

CARNEGIE FELLOWSHIPS FOR RESEARCH AND GRADUATE WORK IN THE DENTAL SCIENCES

AIDED by the Carnegie Corporation, the School of Medicine and Dentistry of the University of Rochester offers scholarships paying $1,200-$1,800 per annum to well-trained dental graduates who are interested in research or who desire special training in the basic medical sciences as an aid to dental teaching or practice. A few fellowships also offer part-time training in oral surgery. On appointment, the applicant is given the title of Carnegie Dental Fellow and, according to his interest, works as a graduate student in one of the departments of the medical school. Here, excellent laboratory facilities, adequate direction and close contact with various investigations related to medicine and dentistry help his research and study. Fellows are encouraged to attend medical classes, seminars and staff meetings and, when opportunity presents itself, to participate in class instruction and scientific meetings. Contact with the problems of clinical dentistry may be maintained through the Oral Surgery Clinic of the Strong Memorial Hospital and the Rochester Dental Dispensary. With the approval of the Graduate Council of the university, Fellows may prepare themselves for the degree of M.S. or Ph.D. Application should be made to

GEORGE H. WHIPPLE, *Dean,*
School of Medicine and Dentistry,
University of Rochester,
Rochester, N. Y.

REFRESHER COURSES IN PERIODONTIA, SCHOOL OF DENTAL AND ORAL SURGERY, COLUMBIA UNIVERSITY, NEW YORK CITY

THE School of Dental and Oral Surgery, Columbia University, offers two refresher courses in periodontia: June 9 to 20: 1. A ten-day intensive course of lectures, discussions and clinical practice. Fee $100. January 24 to May 23: 2. An extended course, one-half day per week for two sessions, of lectures, discussions and supervised technical treatment. Fee $30 for each session.

The courses outlined in this announcement, given at the School of Dental and Oral Surgery, Columbia University, are designed to be "refresher" courses bringing practitioners abreast of modern undergraduate teaching in theory and practice in the subject.

Admission to the course is limited to qualified graduates in dentistry who are members in good standing of the American Dental Association or recognized sectional organizations. In the case of foreign applicants, membership in the applicant's national dental organization is required.

Applicants should fill in an application blank and forward it with a money order or check for the $10 reservation deposit to the assistant to the registrar, School of Dental and Oral Surgery, 630 West 168th Street, New York, N. Y.

COURSE IN MAXILLOFACIAL SURGERY, COLUMBIA UNIVERSITY

COLUMBIA University announces a special course in maxillofacial surgery to be given by the members of the staff of the School of Dental and Oral Surgery and the College of Physicians and Surgeons of Columbia University. The course will be specially adapted to those practicing oral surgery and who are liable to be called for duty with the Army or the Navy. This course starts June 9, continuing to June 21, and includes anatomy and dissection, fractures and bone diseases, anesthesia, surgical prosthesis and plastic procedures and first aid and bandaging. Classes will be limited. For further information and applications, address the office of the dean, School of Dental and Oral Surgery, Columbia University, 630 W. 168th St., New York.

POSTGRADUATE COURSE IN PERIODONTIA, NEW YORK UNIVERSITY COLLEGE OF DENTISTRY

NEW YORK University College of Dentistry will hold its eighth annual postgraduate course in periodontia for twenty sessions, as follows: Schedule A: Morning and afternoon sessions, June 16-27. Schedule B: Morning and afternoon sessions, June 16-18; mornings only, June 19 to July 9. All dates are inclusive. Fee $100. The course is limited to fifteen. Preference will be given in the order of receipt of application. The course will include the etiology, diagnosis and treatment of periodontal disease; various technics of pocket eradication, with conservative treatment stressed; Vincent's infection; diagnosis of types of bone resorption; mouth manifestations of systemic disease; periodontal foci of infection; toothbrushing; instrumentation; balancing of occlusion. Courses are taught by lectures and clinical work, each student treating several cases. Instruction will be given by Samuel Charles Miller, Sidney Sorrin, J. Lewis Blass and the entire periodontia faculty.

For further information and application, address the office of the dean, New York University College of Dentistry, 209 E. 23rd St., New York, N. Y.

RESEARCH FELLOWSHIP IN MEDICINE AND DENTISTRY BY THE GRADUATE SCHOOL OF THE UNIVERSITY OF ILLINOIS

THE Graduate School of the University of Illinois has established four research fellowships to be awarded for one year in the fields of medicine and dentistry in Chicago at a stipend of $1,200 per year (calendar year with one month's vacation). Fellows are eligible for reappointment in competition with the new applicants.

Candidates for these fellowships must have completed a training of not less than eight years beyond high school graduation. This training may have been acquired in any one of the following ways, or the equivalent thereof:

1. Work leading to the B.S. and M.D. degrees. (In some instances, the candidates would have the M.S. degree, or an additional year or two of hospital training beyond the intern year).

2. Work leading to the B.S., M.S. and D.D.S. degrees.

3. Work leading to the B.S. or B.A. degree in a four-year collegiate course and to the D.D.S. degree.

4. Work leading to the B.S., D.D.S. and M.D. degree.

Candidates should indicate the field of research in which they are interested and submit complete transcripts of their scholastic credits, together with the names of three former science teachers as references. March 1 is the deadline for acceptance of applications. Announcements of the fellowship awards will be made April 1, becoming effective September 1.

Formal application blanks can be secured from the secretary of the Committee on Graduate Work in Medicine and Dentistry, 1853 W. Polk St., Chicago, Ill.

STAMP COLLECTORS

WILL any one who has a complete collection of the stamps issued by the Dental Relief Fund Committee please communicate with

FRED R. ADAMS, *Chairman,*
55 W. 42d St.,
New York.

RESIDENCY IN DENTAL MEDICINE

THE University of Oregon Medical School Hospitals and Clinics offer a residency in the Division of Dental Medicine and Oral Surgery. Appointment will be made about the first of December. The period of service is for one year, July 1 to June 30. Compensation is $40 a month in addition to

board, room and laundry. The division is under the general direction of the Department of Medicine. Its service is carried on in several units: 1. The General Outpatient Clinic. 2. The Multnomah Hospital. 3. The Doernbecher Children's Hospital. 4. The University State Tuberculosis Hospital. Service is under the direct supervision of the head of the division and a visiting staff of sixteen dentists. Application blanks will be furnished on request to

RICHARD B. DILLEHUNT, *Dean,*
University of Oregon Medical School,
Portland.

UNITED STATES PATENTS APPLICABLE OR PERTAINING TO DENTISTRY ISSUED DURING FEBRUARY AND MARCH 1941

February 4

No. 2,230,238, SAMUEL DUBERSTEIN and NICHOLAS LAWNER. Sterilizer.
No. 2,230,245, GEORGE HETTINGER. Heater.
No. 2,230,315, SEYMOUR L. WINSLOW. Orthodontic appliance.

February 11

No. 2,231,393, MARTIN J. MULVANY. Dental apparatus.
No. 2,231,505, MAX MEYERSON. Protective holder for toothbrushes and the like.

February 18

No. 2,231,969, HAROLD C. TIFFT. Dental tool.
No. 2,232,236, CHARLES W. HLAVAC and THOMAS HILL. Dental matrix holder.
No. 2,232,269, ZALE A. REUBEN. Toothbrush.

February 25

No. 2,232,978, ARTHUR E. SMITH. Ampule opener.
No. 2,233,020, OSWALD J. LUBBOCK. Method and apparatus for making dental impressions.
No. 2,233,277, JULIUS ADERER. Apparatus for casting metal articles.
No. 2,233,295, ROLAND M. MILLER. Dental flask.

March 4

No. 2,233,522, RUTH A. FICKLE. Dental compact.
No. 2,233,554, DELMER I. PLETCHER. Cannula holder for hypodermic syringes.
No. 2,233,700, CORNELL JOEL GROSSMAN. Refractory mixtures for gas metal molds.
No. 2,233,701, CORNELL JOEL GROSSMAN. Refractory composition for dental molds.
No. 2,233,702, CORNELL JOEL GROSSMAN. Refractory mold materials for cast metal products.
No. 2,233,722, BRUNO WEIGELE. Apparatus for the production of dentures and method of making such apparatus.
No. 2,233,831, MADISON OTEY BURKE. Sanitary toothbrush.
No. 2,233,936, HOWARD R. CAMPBELL. Dental appliance.

March 11

No. 2,234,383, BENNETT PREBLE. Dental impression composition.
No. 2,234,411, WILLIAM S. MCDONALD. Device for making dental plates.
No. 2,234,881, EDWIN LEROY STEIN. Dental articulator.
No. D-125,779, THORVALD H. MIKKELSEN. Design for a dental brush.

March 18

No. 2,234,993, LESTER B. VERNON and HAROLD M. VERNON. Process of manufacturing articles of thermoplastic synthetic resins.
No. 2,234,994, LESTER B. VERNON and HAROLD M. VERNON. Article formed of thermoplastic synthetic resins and process of manufacturing the same.
No. 2,235,524, JOHN A. LENTZ. Dental articulator.

March 25

No. 2,236,034, GEORGE E. LUCE and WILLIAM M. SHEETS. Brush for dentures.
No. 2,236,042, Glendon H. Terwilliger. Orthodontic bracket.
No. 2,236,110, HAROLD N. PERELSON and SEBASTIAN SMIGEL. Attachment for hypodermic syringe for injecting drugs from ampoules.
No. 2,236,204, WALTER J. WILSON. Articulator.
No. 2,236,462, THOMAS A. BINKLEY. Denture brushing device.